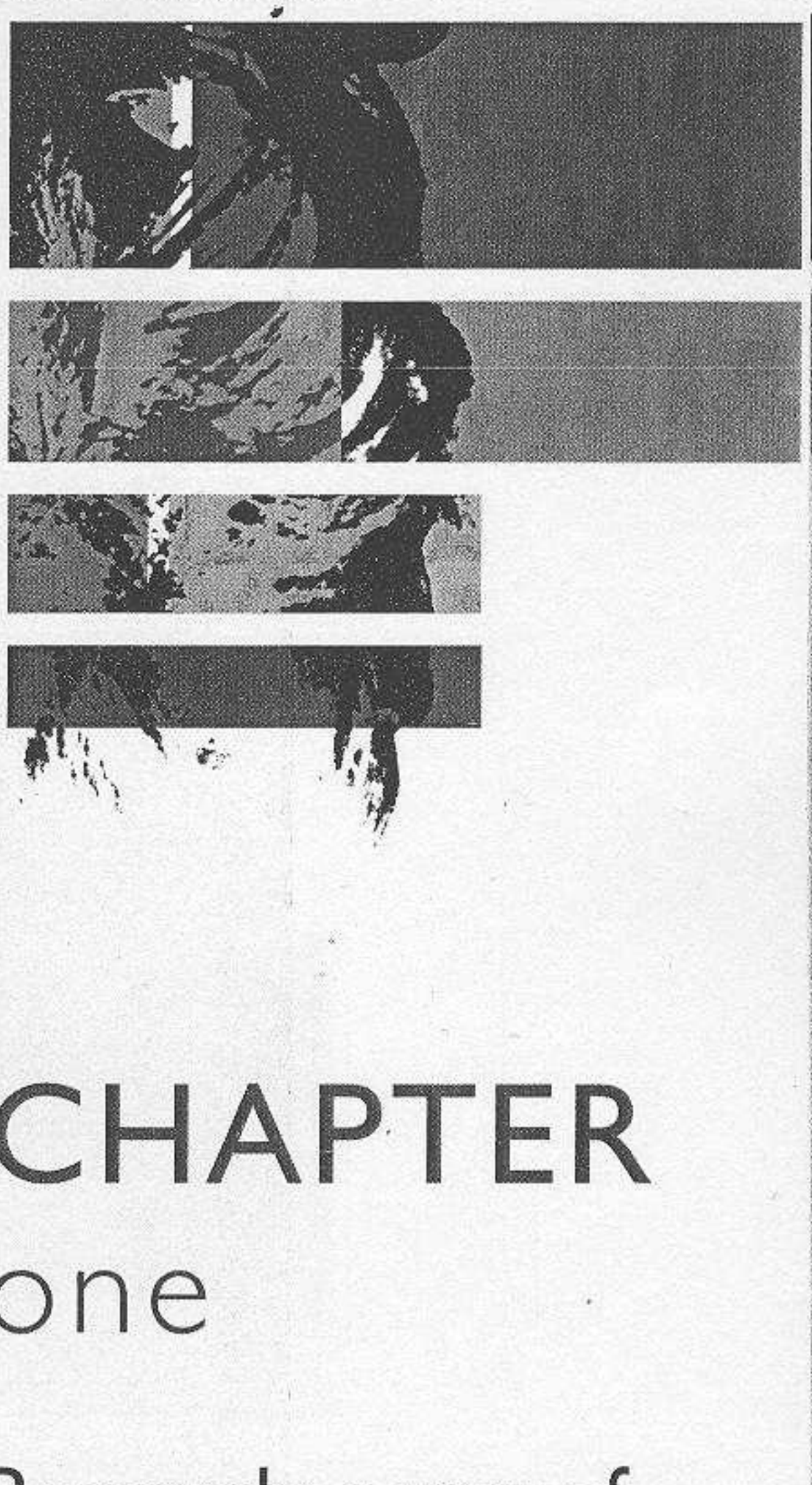
SECOND EDITION

RESEARCH methodology

A STEP-BY-STEP GUIDE FOR BEGINNERS

ranjit kumar



CHAPTER one

Research: a way of thinking

Research: a way of examining your practice

Research is undertaken within most professions. More than a set of skills, research is a way of thinking: examining critically the various aspects of your day-to-day professional work; understanding and formulating guiding principles that govern a particular procedure; and developing and testing new theories for the enhancement of your practice. It is a habit of questioning what you do, and a systematic examination of the observed information to find answers, with a view to instituting appropriate changes for a more effective professional service. Let us take some disciplines as examples.

Suppose you are working in the field of health. You may be a front-line service provider, supervisor or health administrator/planner. You may be in a hospital or working as an out reach community health worker. You may be a nurse, doctor, occupational therapist, physiotherapist, social worker or other paramedic. In any of these positions, some of the following questions may come to your mind:

- How many patients do I see every day?
- What are some of the most common conditions prevalent among my patients?
- What are the causes of these conditions?
- Why do some people have a particular condition whereas others do not?
- What are the health needs of the community?
- Why do some people use the service while others do not?
- What do people think about the service?
- How satisfied are patients with the service?
- How effective is the service?
- How can the service be improved?

You can add many other questions to this list. At times it may be possible to ignore these questions because of the level at which you work, at other times you may make an effort to find answers on your own initiative, or, sometimes, you may be required to obtain answers for effective administration and planning.

Let us take another discipline: business studies. Assume you work in the area of marketing. Again, you can work at different levels: as a salesperson, sales manager or sales promotion executive. The list of questions that may come to your mind can be endless. The types of question and the need to find answers to them will vary with the level at which you work in the organisation. You may just want to find out the monthly fluctuation in the sale of a particular product, or you may be asked to develop an R & D strategic plan to compete for a greater share of the market for the products produced by your company. Besides these, there could be many other questions for which you require answers. For example:

- What is the best strategy to promote the sale of a particular product?
- How many salespersons do I need?
- What is the effect of a particular advertising campaign on the sale of this product?

- How satisfied are the consumers with this product?
- How much are consumers prepared to spend on this item?
- What do consumers like or dislike about this product?
- What type of packaging do consumers prefer for this product?
- What training do the salespersons need to promote the sale of this product?
- What are the attributes of a good salesperson?

To take a different example, let us assume that you work as a psychologist, counsellor or social worker. While engaging in the helping process you may ask yourself (or someone else can ask) the following questions:

- What are my clients' most common presenting problems?
- What are their most common underlying problems?
- What is the socioeconomic background of my clients?
- Why am I successful in certain cases and not in others?
- What resources are available in the community to help a client with a particular need?
- What intervention strategies are appropriate for this problem?
- How satisfied are my clients with my services?

As a supervisor, administrator or manager of an agency, again different questions relating to efficient and effective service may come to your mind. For example:

- How many people are coming to my agency?
- What are the socioeconomic-demographic characteristics of my clients?
- How many cases in a day can a worker effectively handle?
- Why do some people use the service while others do not?
- How effective is the service?
- What are the most common needs of clients who come to this agency?
- What are the strengths and weaknesses of the service?
- How satisfied are the clients with the service?
- How can I improve this service for my clients?

As a professional you might be interested in finding answers to theoretical questions, such as:

- Which is the most effective intervention for a particular problem?
- What causes X or what are the effects of Y?
- What is the relationship between two phenomena?
- How do I measure the self-esteem of my clients?
- How do I ascertain the validity of my questionnaire?
- What is the pattern of program adoption in the community?
- Which is the best way of finding out community attitudes towards an issue?
- Which is the best way to find out the effectiveness of a particular treatment?
- How can I select an unbiased sample?
- What is the best way to find out about the level of marriage satisfaction among my clients?

In this age of consumerism you cannot afford to ignore the consumers of a service. Consumers have the right to ask questions about the quality and effectiveness of the service they are receiving and you, as a service

provider, have an obligation to answer their questions. Some of the questions that a consumer may ask are:

- How effective is the service that I am receiving?
- Am I getting value for money?
- How well-trained are the service providers?

Most professions that are in the human service industry would lend themselves to the questions raised above and you as a service provider should be well prepared to answer them. Research is one of the ways to help you to answer such questions objectively.

Applications of research

Very little research in the field is pure in nature. That is, very few people do research in research methodology *per se*. Most research is applied research, which has wide application in many disciplines. Every profession uses research methods in varying amounts in many areas. They use the methods and procedures developed by research methodologists in order to increase understanding in their own profession and to advance the professional knowledge base. It is through the application of research methodology that they strengthen and advance their own profession. Examine your own field. You will find that its professional practice follows procedures and practices tested and developed by others over a long period of time. It is in this testing process that you need research skills, the development of which fall in the category of pure research. As a matter of fact, the validity of your findings entirely depends upon the soundness of the research methodology adopted.

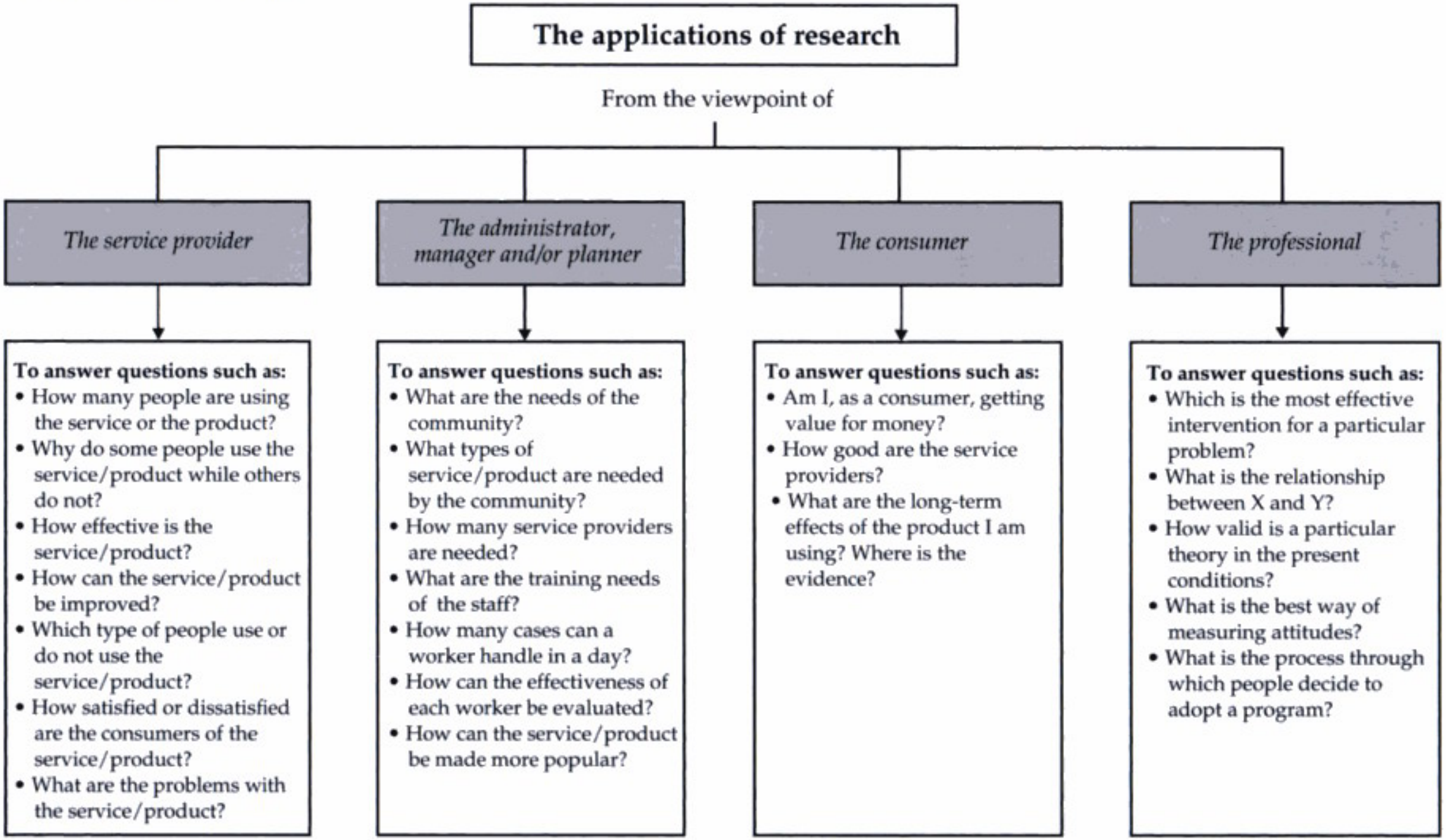
Research techniques applied entirely in nature are used primarily for professional consolidation, understanding, development and advancement.

As just mentioned, the questions that can be raised about any profession where you directly or indirectly provide a service—health (nursing, occupational therapy, physiotherapy, community health, health promotion, public health), education, town planning, library studies, psychology, business studies, social work—can be considered from four different perspectives:

1 the service provider;
2 the service administrator, manager and/or planner;
3 the service consumer; and
4 the professional.

These perspectives are summarised in Figure 1.1. It is impossible to list all the issues in every discipline but this framework can be applied to most disciplines and situations in the humanities and the social sciences to identify, from the viewpoint of the above perspectives, the possible issues in your own academic field.

Figure 1.1 Applications of research



Definitions of research

There are several ways of obtaining answers to your professional questions. These methods range from the fairly informal, based upon clinical impressions, to the strictly scientific, adhering to the conventional expectations of scientific procedures. *Research is one of the ways to find answers to your questions.* When you say that you are undertaking a research study to find out answers to a question, you are implying that the process:

1 is being undertaken within a framework of a set of philosophies;
2 uses procedures, methods and techniques that have been tested for their validity and reliability;
3 is designed to be unbiased and objective.

Your philosophical orientation may stem from one of the several paradigms and approaches in research—positivist, interpretive, phenomenolist, action or participatory, feminist, qualitative, quantitative—and the academic discipline in which you have been trained. The concept of 'validity' can be applied to any aspect of the research process. It ensures that in a research study correct procedures have been applied to find answers to a question. 'Reliability' refers to the quality of a measurement procedure that provides repeatability and accuracy. 'Unbiased and objective' means that you have taken each step in an unbiased manner and drawn each conclusion to the best of your ability and without introducing your own vested interest. The author makes a distinction between bias and subjectivity. Subjectivity is an integral part of your way of thinking that is conditioned by your educational background, discipline, philosophy, experience and skills. Bias, on the other hand, is a deliberate attempt to either conceal or highlight something. For example, a psychologist may look at a piece of information differently from the way in which an anthropologist or a historian looks at it.

Adherence to the three criteria mentioned above enables the process to be called 'research'. Therefore, when you say you are undertaking a research study to find the answer to a question, this implies that the method(s) you are adopting fulfils these expectations (discussed later in the chapter).

However, the degree to which these criteria are expected to be fulfilled varies from discipline to discipline and so the meaning of 'research' differs from one academic discipline to another. For example, the expectations of the research process are markedly different between the physical and the social sciences. In the physical sciences a research endeavour is expected to be strictly controlled at each step, whereas in the social sciences rigid control cannot be enforced and sometimes is not even demanded.

Within the social sciences the level of control required also varies markedly from one discipline to another, as social scientists differ over the need for the research process to meet the above expectations. Despite these differences among disciplines, their broad approach to inquiry is similar. The research model in this book is based upon this broad approach.

As beginners in research you should understand that research is not all technical, complex, statistics and computers. It can be a very simple activity designed to provide answers to very simple questions relating to day-to-day activities. On the other hand, research procedures can also be employed to

formulate intricate theories or laws that govern our lives. The difference between research and non-research activity is, as mentioned, in the way we find answers: the process must meet certain requirements to be called research. To identify these requirements let us examine some definitions of research.

> The word *research* is composed of two syllables, *re* and *search*. The dictionary defines the former as a prefix meaning again, anew or over again and the latter as a verb meaning to examine closely and carefully, to test and try, or to probe. Together they form a noun describing a careful, systematic, patient study and investigation in some field of knowledge, undertaken to establish facts or principles (Grinnell 1993: 4).

Grinnell further adds: 'research is a structured inquiry that utilises acceptable scientific methodology to solve problems and creates new knowledge that is generally applicable.' (1993: 4)

Lundberg (1942) draws a parallel between the social research process, which is considered scientific, and the process that we use in our daily lives. According to him:

> Scientific methods consist of systematic observation, classification and interpretation of data. Now, obviously, this process is one in which nearly all people engage in the course of their daily lives. The main difference between our day-to-day generalisations and the conclusions usually recognised as scientific method lies in the degree of formality, rigorousness, verifiability and general validity of the latter (Lundberg 1942: 5).

Burns (1994: 2) defines research as 'a systematic investigation to find answers to a problem'.

According to Kerlinger (1986: 10), 'scientific research is a systematic, controlled empirical and critical investigation of propositions about the presumed relationships about various phenomena'. Bulmer (1977: 5) states: 'Nevertheless sociological research, as research, is primarily committed to establishing systematic, reliable and valid knowledge about the social world'.

Characteristics of research

From these definitions it is clear that research is a process for collecting, analysing and interpreting information to answer questions. But to qualify as research, the process must have certain characteristics: it must, as far as possible, be controlled, rigorous, systematic, valid and verifiable, empirical, and critical.

Let us briefly examine these characteristics to understand what they mean.

- **Controlled**—in real life there are many factors that affect an outcome. A particular event is seldom the result of a one-to-one relationship. Some relationships are more complex than others. Most outcomes are a sequel to the interplay of a multiplicity of relationships and interacting factors. In a study of cause-and-effect relationships it is important to be able to link the effect(s) with the cause(s) and vice versa. In the study of causation, the establishment of this linkage is essential; however, in practice, particularly in the social sciences, it is extremely difficult—and often impossible—to make the link.

The concept of control implies that, in exploring causality in relation to two variables, you set up your study in a way that minimises the effects of other factors affecting the relationship. This can be achieved to a large extent in the physical sciences, as most of the research is done in a laboratory. However, in the social sciences it is extremely difficult as research is carried out on issues relating to human beings living in society, where such controls are impossible. Therefore, in the social sciences, as you cannot control external factors, you attempt to quantify their impact.

- **Rigorous**—you must be scrupulous in ensuring that the procedures followed to find answers to questions are relevant, appropriate and justified. Again, the degree of rigour varies markedly between the physical and the social sciences and within the social sciences.
- **Systematic**—this implies that the procedures adopted to undertake an investigation follow a certain logical sequence. The different steps cannot be taken in a haphazard way. Some procedures must follow others.
- **Valid and verifiable**—this concept implies that whatever you conclude on the basis of your findings is correct and can be verified by you and others.
- **Empirical**—this means that any conclusions drawn are based upon hard evidence gathered from information collected from real-life experiences or observations.
- **Critical**—critical scrutiny of the procedures used and the methods employed is crucial to a research inquiry. The process of investigation must be foolproof and free from any drawbacks. The process adopted and the procedures used must be able to withstand critical scrutiny.

For a process to be called research, it is imperative that it has the above characteristics.

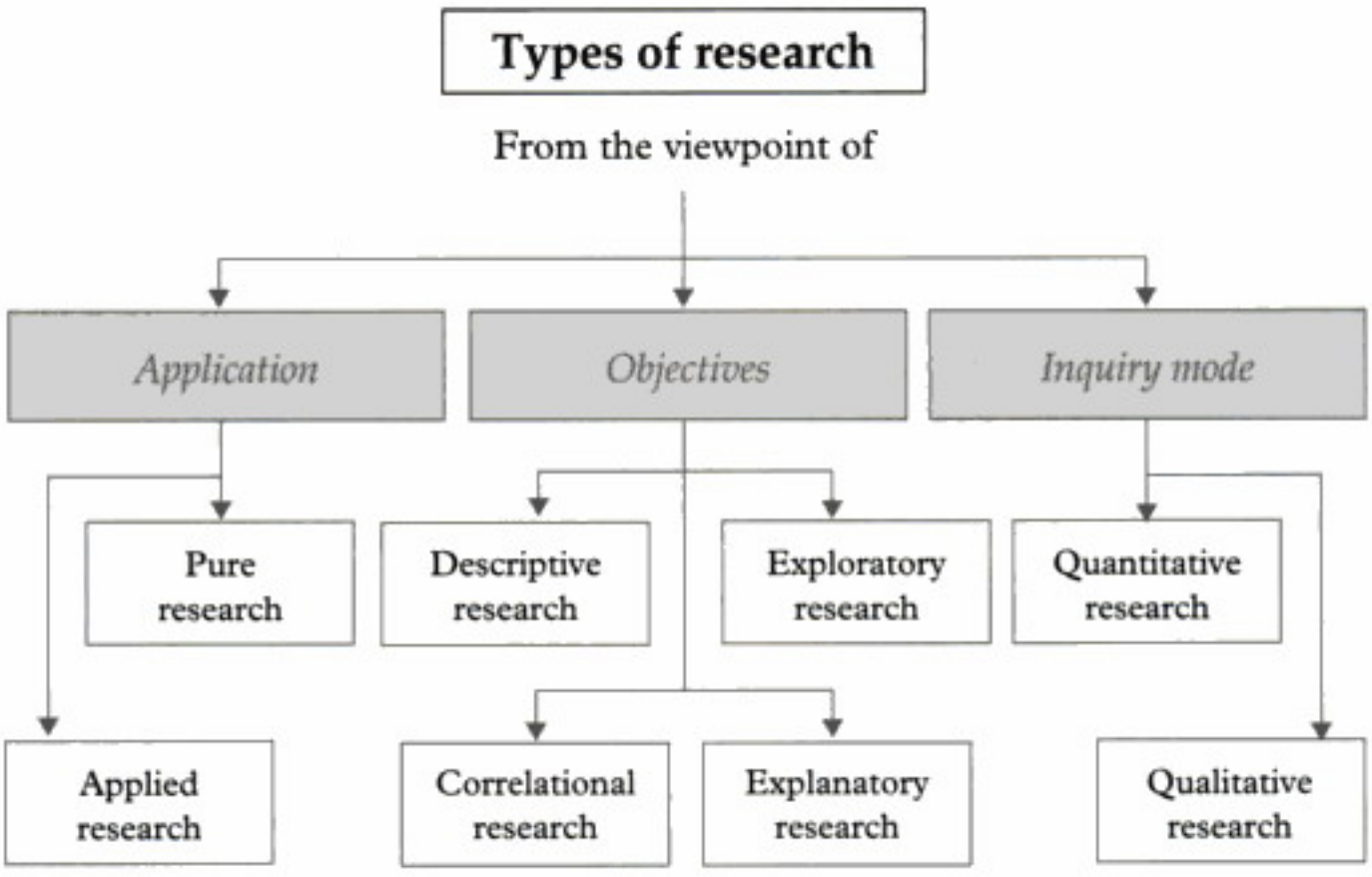
Types of research

Research can be classified from three perspectives (Figure 1.2):

1 *application* of the research study;
2 *objectives in undertaking* the research;
3 *inquiry mode* employed.

These three classifications are not mutually exclusive—that is, a research study classified from the viewpoint of 'application' can also be classified from the perspectives of 'objectives' and 'inquiry mode employed'. For example, a research project may be classified as pure or applied research (from the perspective of application), as descriptive, correlational, explanatory or exploratory (from the perspective of objectives) and as qualitative or quantitative (from the perspective of the inquiry mode employed).

Figure 1.2 Types of research



Application

If you examine a research endeavour from the perspective of its application, there are two broad categories: pure research and applied research. In the social sciences, according to Bailey (1978: 17):

> Pure research involves developing and testing theories and hypotheses that are intellectually challenging to the researcher but may or may not have practical application at the present time or in the future. Thus such work often involves the testing of hypotheses containing very abstract and specialised concepts.

Pure research is also concerned with the development, examination, verification and refinement of research methods, procedures, techniques and tools that form the body of research methodology. Examples of pure research include developing a sampling technique that can be applied to a particular situation; developing a methodology to assess the validity of a procedure; developing an instrument, say, to measure the stress level in people; and finding the best way of measuring people's attitudes. The knowledge produced through pure research is sought in order to add to the existing body of knowledge of research methods.

Most of the research in the social sciences is applied. In other words the research techniques, procedures and methods that form the body of research methodology are applied to the collection of information about various aspects of a situation, issue, problem or phenomenon so that information gathered can be used in other ways—such as for policy formulation, administration and the enhancement of understanding of a phenomenon.

Objectives

If you examine a research study from the perspective of its objectives, broadly a research endeavour can be classified as descriptive, correlational, explanatory or exploratory.

A study classified as *descriptive research* attempts to describe systematically a situation, problem, phenomenon, service or program, or provides information about, say, the living conditions of a community, or describes attitudes towards an issue. For example, it may attempt to describe the types of service provided by an organisation, the administrative structure of an organisation, the living conditions of Aboriginal people in the outback, the needs of a community, what it means to go through a divorce, how a child feels living in a house with domestic violence, or the attitudes of employees towards management. The main purpose of such studies is to describe what is prevalent with respect to the issue/problem under study.

The main emphasis in a *correlational research* study is to discover or establish the existence of a relationship/association/interdependence between two or more aspects of a situation. What is the impact of an advertising campaign on the sale of a product? What is the relationship between stressful living and the incidence of heart attack? What is the relationship between fertility and mortality? What is the relationship between technology and unemployment? What is the effect of a health service on the control of a disease, or the home environment on educational achievement? These studies examine whether there is a relationship between two or more aspects of a situation or phenomenon and, therefore, are called correlational studies.

Explanatory research attempts to clarify why and how there is a relationship between two aspects of a situation or phenomenon. This type of research attempts to explain, for example, why stressful living results in heart attacks; why a decline in mortality is followed by fertility decline; or how the home environment affects children's level of academic achievement.

The fourth type of research, from the viewpoint of the objectives of a study, is called *exploratory research*. This is when a study is undertaken with the objective either to explore an area where little is known or to investigate the possibilities of undertaking a particular research study. When a study is carried out to determine its feasibility it is also called a *feasibility study* or a *pilot study*. It is usually carried out when a researcher wants to explore areas about which s/he has little or no knowledge. A small-scale study is undertaken to decide if it is worth carrying out a detailed investigation. On the basis of the assessment made during the exploratory study, a full study may eventuate. Exploratory studies are also conducted to develop, refine and/or test measurement tools and procedures. Table 1.1 shows types of research study from the viewpoint of objectives.

Although, theoretically, a research study can be classified in one of the above perspectives, in practice most studies are a combination of the first three categories; that is, they contain elements of descriptive, correlational and explanatory research. In this book the guidelines suggested for writing a research report encourage you to integrate these aspects.

Table 1.1 Types of research studies from the viewpoint of objectives

Examples	*Aim*	*Main theme*	*Type of research*
• Socioeconomic characteristics of residents of a community • Attitudes of students towards quality of teaching • Types of service provided by an agency • Needs of a community • Sale of a product • Attitudes of nurses towards death and dying • Attitudes of workers towards management • Number of people living in a community • Problems faced by new immigrants • Extent of occupational mobility among immigrants • Consumers' likes and dislikes with regard to a product • Effects of living in a house with domestic violence • Strategies put in place by a company to increase productivity of workers	**To describe what is prevalent regarding:** • a group of people • a community • a phenomenon • a situation • a program • an outcome	**To describe what is prevalent**	Descriptive research
• Impact of a program • Relationship between stressful living and incidence of heart attacks • Impact of technology on employment • Impact of maternal and child health services on infant mortality • Effectiveness of a marriage counselling service on extent of marital problems • Impact of an advertising campaign on sale of a product • Impact of incentives on productivity of workers • Effectiveness of an immunisation program in controlling infectious disease	**To establish or explore:** • a relationship • an association • an interdependence	**To ascertain if there is a relationship**	Correlational research
• Why does stressful living result in heart attacks? • How does technology create unemployment/employment? • How do maternal and child health services affect infant mortality? • Why do some people have a positive attitude towards an issue while others do not? • Why does a particular intervention work for some people and not for others? • Why do some people use a product while others do not? • Why do some people migrate to another country while others do not? • Why do some people adopt a program while others do not?	**To explain:** • *why* a relationship, association or interdependence exists • *why* a particular event occurs	**To explain why the relationship is formed**	Explanatory research

Inquiry mode

The third perspective in our typology of research concerns the process you adopt to find answers to your research questions. Broadly, there are two approaches to inquiry:

1 the ***structured*** approach;
2 the ***unstructured*** approach.

The structured approach to inquiry is usually classified as ***quantitative research*** and unstructured as ***qualitative research***. In the structured approach everything that forms the research process—objectives, design, sample, and the questions that you plan to ask of respondents—is predetermined. The unstructured approach, by contrast, allows flexibility in all these aspects of the process. The structured approach is more appropriate to determine the ***extent*** of a problem, issue or phenomenon; the unstructured, to explore its ***nature***. Both approaches have their place in research. Both have their strengths and weaknesses. Therefore, you should not 'lock' yourself into solely quantitative or qualitative research. The choice of a structured or unstructured approach, and of a quantitative or qualitative mode of inquiry, should depend upon:

- **Aim of your inquiry**—exploration, confirmation or quantification.
- **Use of the findings**—policy formulation or process understanding.

The distinction between quantitative and qualitative research, in addition to the structured/unstructured process of inquiry, is also dependent upon some other considerations which are briefly presented in Table 2.1 on page 17.

The study is classified as qualitative if the purpose of the study is primarily to describe a situation, phenomenon, problem or event; the information is gathered through the use of variables measured on nominal or ordinal scales (qualitative measurement scales); and if analysis is done *to establish the variation* in the situation, phenomenon or problem *without quantifying it*. The description of an observed situation, the historical enumeration of events, an account of the different opinions people have about an issue, and a description of the living conditions of a community are examples of qualitative research.

On the other hand, the study is classified as a quantitative study if you want to *quantify the variation* in a phenomenon, situation, problem or issue; if information is gathered using predominantly quantitative variables; and if the analysis is geared to ascertain the *magnitude of the variation*. Examples of quantitative aspects of a research study are: How many people have a particular problem? How many people hold a particular attitude?

The use of statistics is *not* an integral part of a quantitative study. The main function of statistics is to act as a test to confirm or contradict the conclusions that you have drawn on the basis of your understanding of analysed data. Statistics, among other things, help you to quantify the magnitude of an association or relationship, provide an indication of the confidence you can place in your findings and help you to isolate the effect of different variables.

It is strongly recommended that you do not lock yourself into becoming either solely a quantitative or solely a qualitative researcher. It is true that there are disciplines that lend themselves predominantly either to qualitative or to quantitative research. For example, such disciplines as anthropology, history and sociology are more inclined towards qualitative research, whereas psychology, epidemiology, education, economics, public health and marketing are more inclined towards quantitative research. However, this does not mean that an economist or a psychologist never uses the qualitative approach, or that an anthropologist never uses quantitative information. There is increasing recognition by most disciplines in the social sciences that both types of research are important for a good research study. The research problem itself should determine whether the study is carried out using quantitative or qualitative methodologies.

Both qualitative and quantitative approaches have their strengths and weaknesses, and advantages and disadvantages. 'Neither one is markedly superior to the other in all respects' (Ackroyd & Hughes 1992: 30). The measurement and analysis of the variables about which information is obtained in a research study are dependent upon the purpose of the study. In many studies you need to combine both qualitative and quantitative approaches. For example, suppose you want to find out the types of service available to victims of domestic violence in a city and the extent of their utilisation. Types of service is the qualitative aspect of the study as finding out about them entails description of the services. The extent of utilisation of the services is the quantitative aspect as it involves estimating the number of people who use the services and calculating other indicators that reflect the extent of utilisation.

Paradigms of research

There are two main paradigms that form the basis of research in the social sciences. It is beyond the scope of this book to go into any detail about these. The crucial question that divides the two is whether the methodology of the physical sciences can be applied to the study of social phenomena. The paradigm that is rooted in the physical sciences is called the systematic, scientific or positivist approach. The opposite paradigm has come to be known as the qualitative, ethnographic, ecological or naturalistic approach. The advocates of the two opposing sides have developed their own values, terminology, methods and techniques to understand social phenomena. However, since the mid-1960s there has been a growing recognition that both paradigms have their place. The research purpose should determine the mode of inquiry, hence the paradigm. To indiscriminately apply one approach to all the research problems can be misleading and inappropriate.

A positivist paradigm lends itself to both quantitative and qualitative research. You can conduct qualitative research within the positivist paradigm. However, the author makes a distinction between qualitative data on the one hand and qualitative research on the other as the first is confined to the measurement of variables and the second to a use of methodology.

The author believes that no matter what paradigm the researcher works within, s/he should adhere to certain values regarding the control of bias, and the maintenance of objectivity in terms of both the research process itself and the conclusions drawn. It is the application of these values to the process of information gathering, analysis and interpretation that enables it to be called a research process.

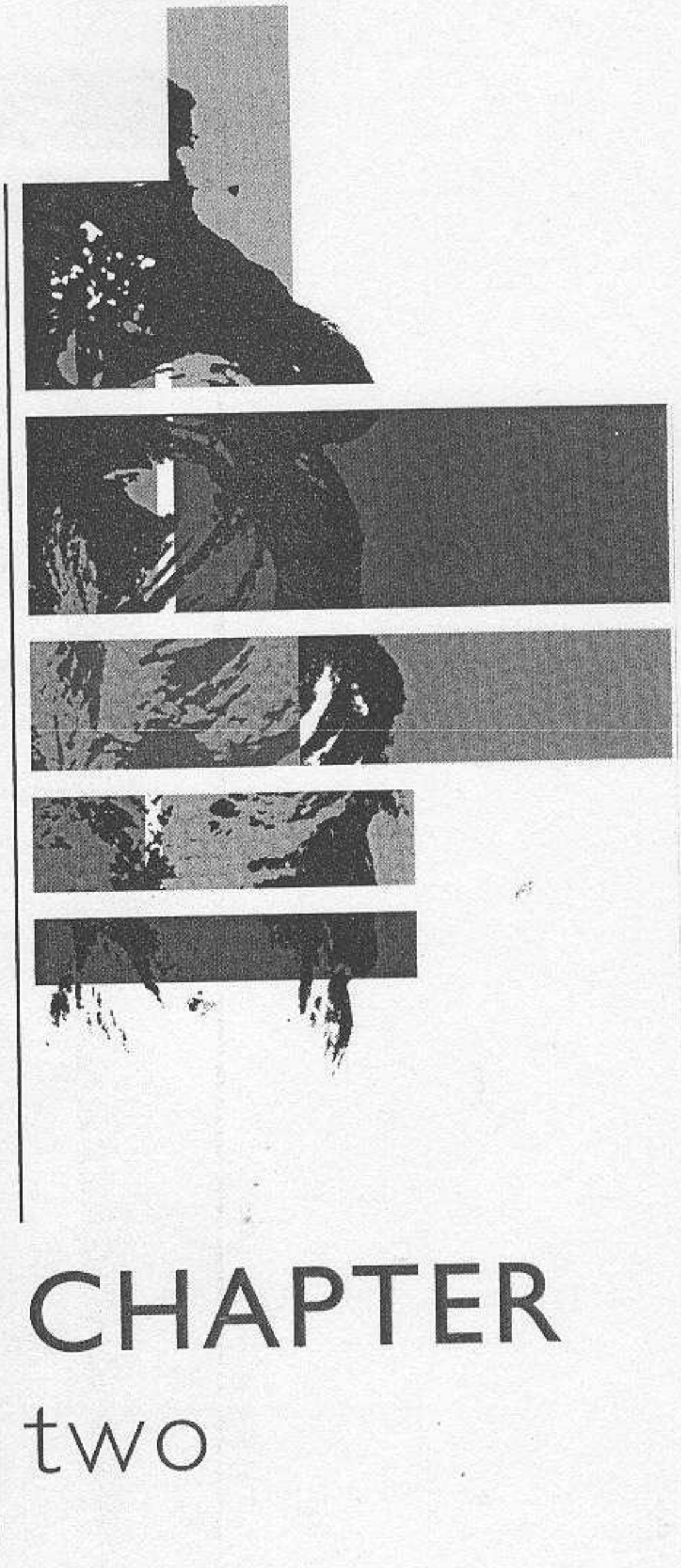
SUMMARY

There are several ways of collecting and understanding information and finding answers to your questions—research is one way. The difference between research and other ways of obtaining answers to your questions is that in a process that is classified as research, you work within a framework of a set of philosophies, use methods that have been tested for validity and reliability, and attempt to be unbiased and objective.

Research has many applications. You need to have research skills to be an effective service provider, administrator/manager or planner. As a professional who has a responsibility to enhance professional knowledge, research skills are essential.

The typology of research can be looked at from three perspectives: application, objectives and the inquiry process. From the point of view of the application of research, there is applied and pure research. Most of the research undertaken in the social sciences is applied, the findings being designed either for use in understanding a phenomenon/issue or to bring change in a program/situation. Pure research is academic in nature and is undertaken in order to gain knowledge about phenomena that may or may not have application in the near future, and to develop new techniques and procedures that form the body of research methodology. A research study can be carried out with four objectives: to describe a situation, phenomenon, problem or issue (descriptive research); to establish or explore a relationship between two or more variables (correlational research); to explain why certain things happen the way they do (explanatory research); and to examine the feasibility of conducting a study (exploratory research). From the point of view of the mode of inquiry, there are two types of research: quantitative and qualitative. The main objective of a qualitative study is to describe the variation in a phenomenon, situation or attitude, whereas quantitative research, in addition, helps you to quantify the variation.

There are two main paradigms that form the basis of social science research: positivist and naturalist. The crucial question that divides the two is whether the methodology of research in the physical sciences can be applied to research in the social sciences.



CHAPTER two

The research process: a quick glance

> But much advantage will occur if men of science become their own epistemologists, and show to the world by critical exposition in non-technical terms the results and methods of their constructive work, that more than mere instinct is involved in it: the community has indeed a right to expect as much as this (Poincaré 1952: xii).

The research process: an eight-step model

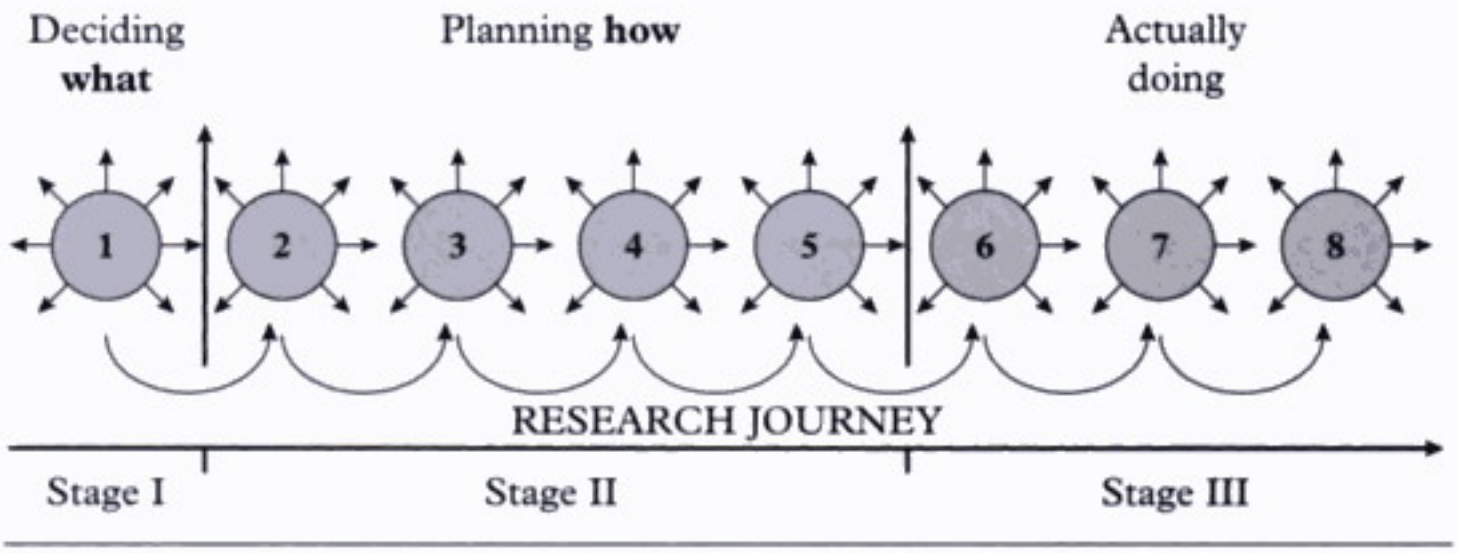
Research methodology is taught as a supporting subject in several ways in many academic disciplines at various levels by people committed to a variety of research paradigms. Though paradigms vary in their contents and substance, their broad approach to inquiry, in the author's opinion, is similar. Such ideas have also been expressed by Festinger and Katz, who in the foreword of their book *Research Methods in Behavioral Sciences* say that 'Although the basic logic of scientific methodology is the same in all fields, its specific techniques and approaches will vary, depending upon the subject matter' (1966: vi). Therefore, the model developed here is generic in nature and can be applied to a number of disciplines in the social sciences. It is based upon a practical and step-by-step approach to a research inquiry and each step provides a smorgasbord of methods, models and procedures.

Suppose you want to go out for a drive. Before you start, you must decide where you want to go and then which route to take. If you know the route, you do not need to consult a street directory but, if you do not, you need to use one. Your problem is compounded if there is more than one route. You need to decide which one to take. The research process is very similar to undertaking a journey. As with your drive, for a research journey there are also two important decisions to make. The first is to decide *what you want to find out about* or, in other words, what research questions you want to find answers to. Having decided upon your research questions or problems, you then need to think *how to go about finding their answers*. The path to finding answers to your research questions constitutes research methodology. Just as there are posts along the way to your travel destination, so there are practical steps through which you must pass in your research journey in order to find the answers to your research questions (Figure 2.1). The sequence of these steps is not absolute. With experience you can change it. At each operational step in the research process you are required to choose from a multiplicity of methods, procedures and models of research methodology which will help you to best achieve your objectives. This is where your knowledge base of research methodology plays a crucial role.

The aim of this book is to provide you with knowledge that will enable you to select the most appropriate methods and procedures. The strength of this book lies in anchoring the theoretical knowledge to the posts of the research journey. A smorgasbord choice at each operation step aims to

provide, at a beginner's level, knowledge of methods and procedures used both by qualitative and quantitative researchers, though the book is more inclined towards the quantitative way of thinking.

Figure 2.1 The research journey—touch each post and select methods and procedures appropriate for your journey



Quantitative and qualitative research methodologies differ in the philosophy that underpins their mode of inquiry as well as, to some extent, in methods, models and procedures used. Though the research process is broadly the same in both, quantitative and qualitative research are differentiated in terms of the methods of data collection, the procedures adopted for data processing and analysis, and the style of communication of the findings. If your research problem lends itself to a qualitative mode of inquiry, you are more likely to use the *unstructured interview* or *observation* as your method of data collection. When analysing data in qualitative research you go through the process of identifying themes and describing what you have found out during your interviews or observation rather than subjecting your data to statistical procedures. Table 2.1 summarises the differences between qualitative and quantitative research.

Table 2.1 Differences between qualitative and quantitative research

Difference with respect to:	*Quantitative research*	*Qualitative research*
Underpinning philosophy	Rationalism: 'That human beings achieve knowledge because of their capacity to reason' (Bernard 1994: 2)	Empiricism: 'The only knowledge that human beings acquire is from sensory experiences' (Bernard 1994: 2)
Approach to inquiry	Structured/rigid/predetermined methodology	Unstructured/flexible/open methodology
Main purpose of investigation	To quantify extent of variation in a phenomenon, situation, issue etc.	To describe variation in a phenomenon, situation, issue etc.

(Continued on next page)

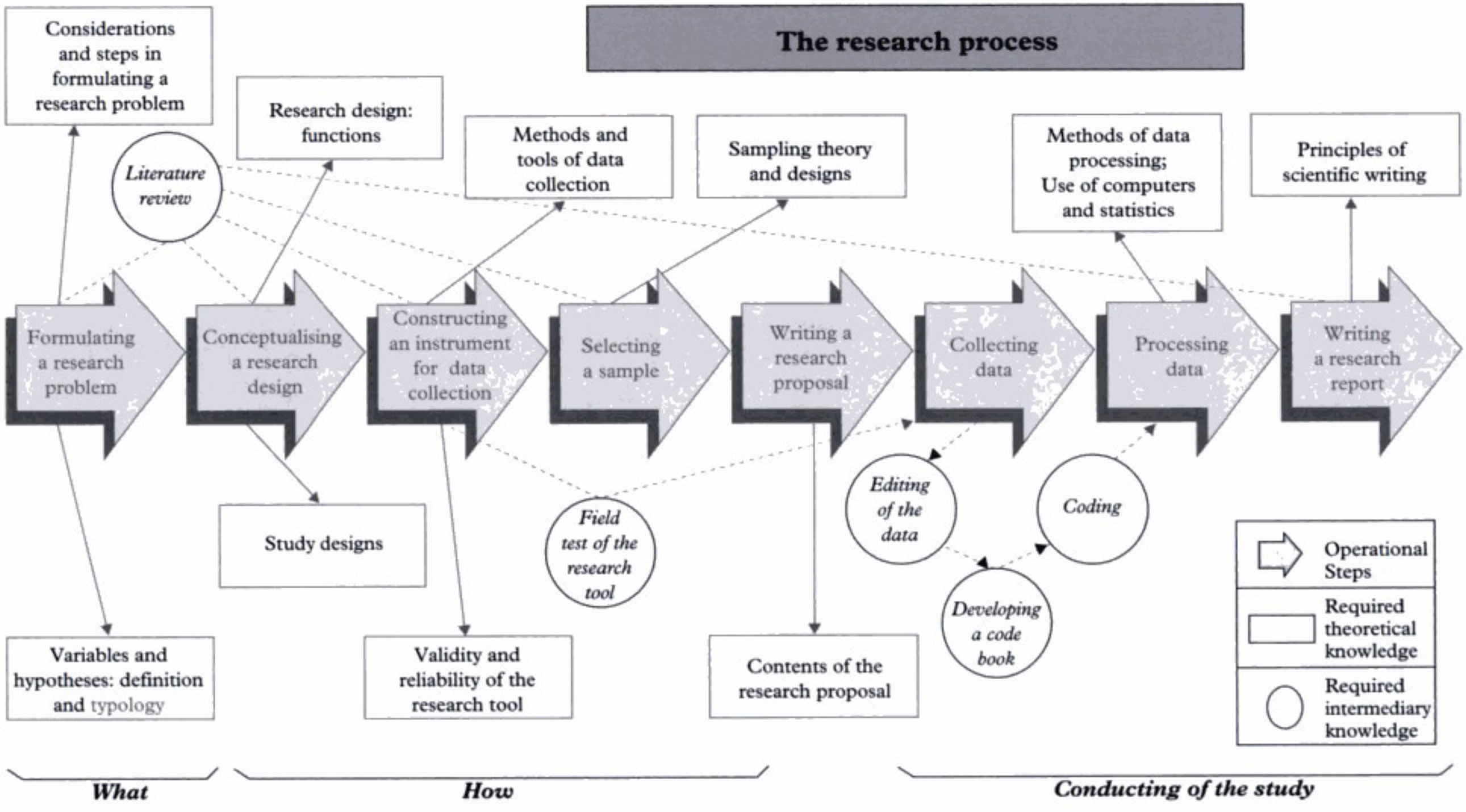
Table 2.1—*Continued*

Difference with respect to:	*Quantitative research*	*Qualitative research*
Measurement of variables	Emphasis on some form of either measurement or classification of variables	Emphasis on description of variables
Sample size	Emphasis on greater sample size	Fewer cases
Focus of inquiry	Narrows focus in terms of extent of inquiry, but assembles required information from a greater number of respondents	Covers multiple issues but assembles required information from fewer respondents
Dominant research value	Reliability and objectivity (value-free)	Authenticity but does not claim to be value-free
Dominant research topic	Explains prevalence, incidence, extent, nature of issues, opinions and attitude; discovers regularities and formulates theories	Explores experiences, meanings, perceptions and feelings
Analysis of data	Subjects variables to frequency distributions, cross-tabulations or other statistical procedures	Subjects responses, narratives or observation data to identification of themes and describes these
Communication of findings	Organisation more analytical in nature, drawing inferences and conclusions, and testing magnitude and strength of a relationship	Organisation more descriptive and narrative in nature

Since, at a number of steps of the research process the choice of methods and procedures is influenced by quantitative/qualitative distinction, the methods and procedures discussed in some chapters are differentiated; however, I have tried to keep this distinction to the minimum as the model is applicable to both. Note that this book is for beginners. There is not enough space to cover extensively the applicability and use of each method, model and procedure. I have elaborated on those associated with quantitative research more than on those linked to qualitative research. For a deeper understanding of a method or procedure relating to either, you may wish to consult other books identified in the text.

Figure 2.2 shows the proposed model. The tasks identified in *arrows* are the operational steps you need to follow in order to conduct a study, quantitative or qualitative. Topics identified in *rectangles* are the required theoretical knowledge needed to carry out these steps. The tasks identified in *circles* are the intermediary steps that you need to complete to go from one step to another. It is important for a beginner to work through these steps in the proposed sequence, though with experience you do not need to follow the sequence.

Figure 2.2 The research process



This book is written around the theoretical knowledge required to undertake each operational step and follows the same sequential progression as is needed to undertake a research investigation. For each operational step, the required theoretical knowledge is further organised, in different chapters, around the operational step to which, in the author's opinion, it is most logically related (Figure 2.3). Again, for a beginner, it is important to study this diagram to relate the theoretical knowledge to the operational steps.

The following sections of this chapter provide a quick glance at the whole process to acquaint you with the various tasks you need to undertake to carry out your study, thus giving you some idea of what the research journey involves.

Steps in planning a research study

Step I: formulating a research problem

Formulating a research problem is the first and most important step in the research process. A research problem identifies your destination: it should tell you, your research supervisor and your readers *what* you intend to research. The more specific and clear you are the better, as everything that follows in the research process—study design, measurement procedures, sampling strategy, frame of analysis and the style of writing of your dissertation or report—is greatly influenced by the way in which you formulate your research problem. Hence, you should give it considerable and careful thought at this stage. The main function of formulating a research problem is to decide *what* you want to find out *about*. Chapter 4 deals in detail with various aspects of formulating a research problem.

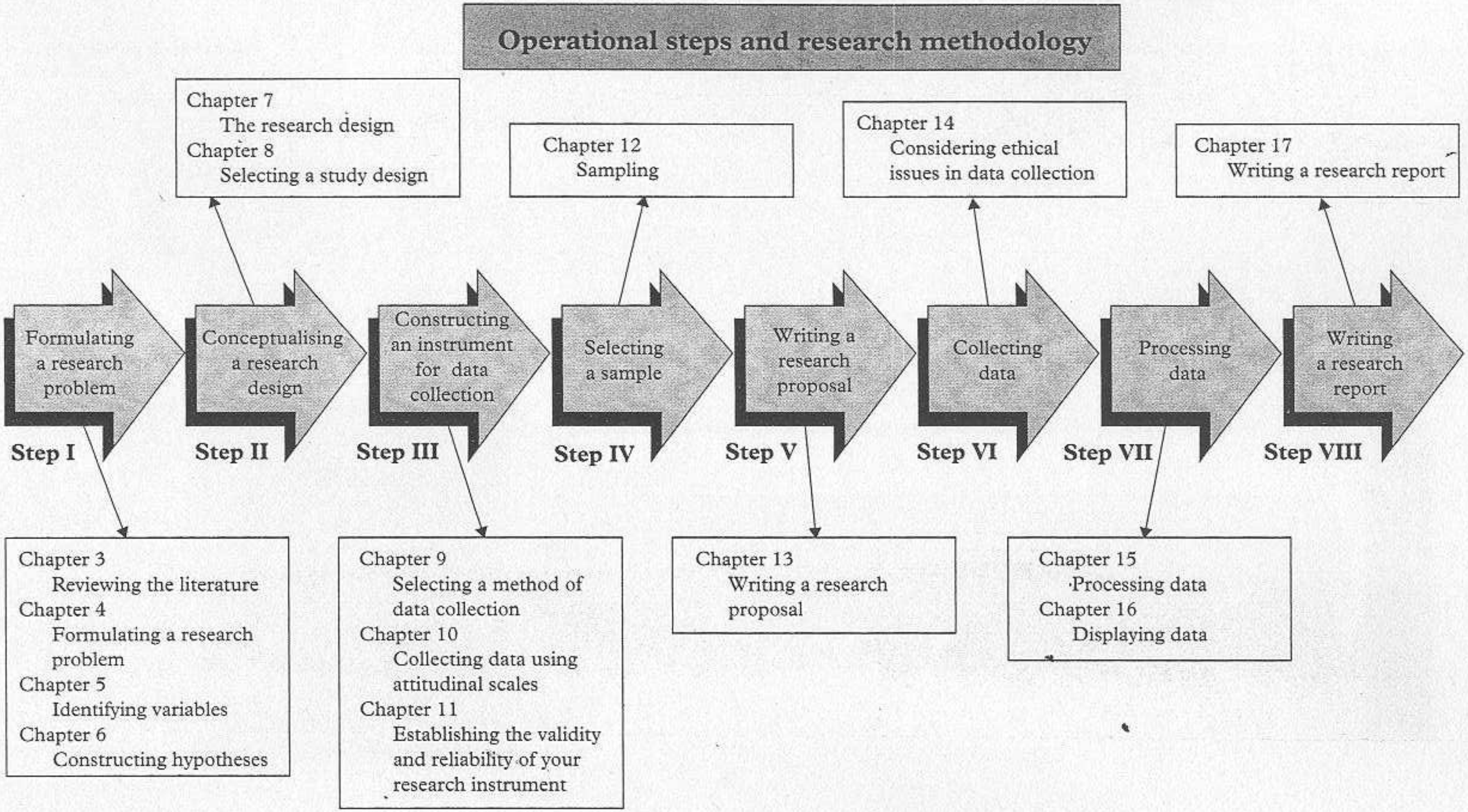
It is extremely important to evaluate the research problem in the light of the financial resources at your disposal, the time available, and your own and your research supervisor's expertise and knowledge in the field of study. It is equally important to identify any gaps in your knowledge of relevant disciplines, such as statistics required for analysis. Also, ask yourself whether you have sufficient knowledge about computers and software if you plan to use them.

Step II: conceptualising a research design

An extremely important feature of research is the use of appropriate methods. Research involves systematic, controlled, valid and rigorous exploration and description of what is not known and establishment of associations and causation that permit the accurate prediction of outcomes under a given set of conditions. It also involves identifying gaps in knowledge, verification of what is already known, and identification of past errors and limitations. The strength of *what* you find largely rests on *how* it was found.

The main function of a research design is to explain *how* you will find answers to your research questions. The research design sets out the logic

Figure 2.3 The chapters in the book in relation to the operational steps



of your inquiry. A research design should include the following: the study design *per se* and the logistical arrangements that you propose to undertake, the measurement procedures, the sampling strategy, the frame of analysis and the time-frame. For any investigation, the selection of an appropriate research design is crucial in enabling you to arrive at valid findings, comparisons and conclusions. A faulty design results in misleading findings and is therefore tantamount to wasting human and financial resources. In scientific circles, the strength of an empirical investigation is primarily evaluated in the light of the research design adopted. When selecting a research design it is important to ensure that it is *valid*, *workable* and *manageable*. Chapter 7 provides details about research design.

There is an enormous variety of study designs and you need to be acquainted with some of the most common ones. Chapter 8 explains some of these designs. Select or develop the design that is most suited to your study. You must have strong reasons for selecting a particular design; you must be able to justify your selection; and you should be aware of its strengths, weaknesses and limitations. In addition, you will need to explain the logistical details needed to implement the suggested design.

Step III: constructing an instrument for data collection

Anything that becomes a means of collecting information for your study is called a 'research tool' or a 'research instrument'. For example, observation forms, interview schedules, questionnaires and interview guides are all classified as research tools.

The construction of a research tool is the first 'practical' step in carrying out a study. You will need to decide how you are going to collect data for the proposed study and then construct a research instrument for data collection. Chapter 9 details the various methods of data collection and Chapter 10 deals with methods for collecting data using attitudinal scales.

If you are planning to collect data specifically for your study (primary data), you need to either construct a research instrument or select an already constructed one. The process of developing a research instrument is also discussed in Chapter 9. The concepts of validity and reliability in relation to a research instrument are discussed in Chapter 11.

If you are using secondary data (information already collected for other purposes), develop a form to extract the required data. In order to determine what information is required, go through the same process as described for primary data above.

Field testing, also known as pre-testing, a research tool is an integral part of instrument construction. As a rule, the field test should not be carried out on the sample of your study but on a similar population.

If you are planning to use a computer for data analysis, you may wish to provide space for coding the data on the research instrument.

Step IV: selecting a sample

The accuracy of your findings largely depends upon the way you select your sample. The basic objective of any sampling design is to minimise, within the limitation of cost, the gap between the values obtained from your sample and those prevalent in the population.

The underlying premise in sampling is that, if a relatively small number of units is selected, it can provide—with a sufficiently high degree of probability—a fairly true reflection of the sampling population that is being studied.

Sampling theory is guided by two principles:

1 the avoidance of bias in the selection of a sample; and
2 the attainment of maximum precision for a given outlay of resources.

There are three categories of sampling design (Chapter 12):

1 random/probability sampling designs;
2 non-random/probability sampling designs; and
3 'mixed' sampling design.

There are several sampling strategies within the first two categories. You need to be acquainted with these sampling designs to select the one most appropriate for your study. You need to know the strengths and weaknesses of each and the situations in which they can or cannot be applied in order to select the most appropriate design. The type of sampling strategy you use also determines your ability to generalise from the sample to the total population and the type of statistical tests you can perform on the data.

Step V: writing a research proposal

Now, step by step, you have done all the preparatory work. Next put everything together in a way that provides adequate information, for your research supervisor and others, about your research study. This overall plan tells a reader about your research problem and how you are planning to investigate, and is called a *research proposal.* Broadly, a research proposal's main function is to detail the operational plan for obtaining answers to your research questions. In doing so it ensures—and reassures the readers of—the validity of the methodology to obtain answers accurately and objectively.

Universities and other institutions may have differing requirements regarding the style and content of a research proposal, but the majority of institutions would require most of what is set out here. Requirements may also vary within an institution, from discipline to discipline or from supervisor to supervisor. However, the guidelines set out in Chapter 13 provide a framework which will be acceptable to most.

A research proposal must tell you, your research supervisor and a reviewer the following information about your study:

- *what* you are proposing to do;
- *how* you plan to proceed;
- *why* you selected the proposed strategy.

Therefore it should contain the following information about your study (Chapter 13):

- a statement of the *objectives* of the study;
- a list of *hypotheses*, if you are testing any;
- the *study design* you are proposing to use;
- the *setting* for your study;
- the research *instrument(s)* you are planning to use;
- information on *sample size* and *sampling design*;
- information on *data-processing* procedures;
- an outline of the proposed *chapters* for the report;
- the study's *problems* and *limitations*; and
- the proposed *time-frame*.

Steps in conducting a study

Step VI: collecting data

Having formulated a research problem, developed a study design, constructed a research instrument and selected a sample, you then collect the data from which you will draw inferences and conclusions for your study.

Many methods could be used to gather the required information. As a part of the research design, you decided upon the procedure you wanted to adopt to collect your data. *At this stage you actually collect the data.* For example, depending upon your plans, you might commence interviews, mail out a questionnaire, conduct nominal/focused group discussions or make observations. Collecting data through any one of the methods may involve some ethical issues, which are discussed in Chapter 14.

Step VII: processing data

The way you analyse the information you collected largely depends upon two things:

1 type of information—descriptive, quantitative, qualitative or attitudinal;
2 the way you want to communicate your findings to your readers.

There are two broad categories of report: quantitative and qualitative. As mentioned earlier, the distinction is more academic than real as in most studies you need to combine quantitative and qualitative skills. Nevertheless, there are some solely qualitative and some solely quantitative studies. Chapter 15 describes different ways of analysing quantitative data and Chapter 16 details various methods of displaying analysed data.

In addition to the qualitative–quantitative distinction, it is equally important for data analysis that you consider whether the data is to be analysed manually or by a computer.

If your study is purely descriptive, you can write your dissertation/report on the basis of your field notes, manually analyse the contents of your notes (content analysis), or use a computer program such as NUD*DIST N6, NVIVO or Ethnograph for this purpose.

If you want quantitative analysis, it is also necessary to decide upon the type of analysis required (i.e. frequency distribution, cross-tabulations or

other statistical procedures, such as regression analysis, factor analysis and analysis of variance) and how it should be presented. Also identify the variables to be subjected to these statistical procedures.

Step VIII: writing a research report

Writing the report is the last and, for many, the most difficult step of the research process. This report informs the world what you have done, what you have discovered and what conclusions you have drawn from your findings. If you are clear about the whole process, you will also be clear about the way you want to write your report. Your report should be written in an academic style and be divided into different chapters and/or sections based upon the main themes of your study. Chapter 17 suggests some of the ways of writing a research report.

SUMMARY

This chapter has provided an overview of the research process, which has been broken into eight steps, the details of which are covered in the remainder of this book. At each step the model provides a smorgasbord of methods, models, techniques and procedures so you can select the one most appropriate for your study. It is like a buffet party with eight tables, each with different dishes, but the dishes are made out of similar ingredients. You go to all eight tables and select the dish that you like most from each table. The main difference between the model and the example given is that in the model you select what is most appropriate for your study and not what you like the most, as in a buffet. For a beginner it is important to go through all the steps, although perhaps not in the same sequence. With experience you can take a number of short cuts.

The eight steps cover the total spectrum of a research endeavour, starting from problem formulation through to writing a research report. The steps are operational in nature, following a logical sequence, and detailing the various methods and procedures in a simple step-by-step manner.

STEP 1

FORMULATING A RESEARCH PROBLEM

CHAPTER 3
Reviewing the literature

CHAPTER 4
Formulating a research problem

CHAPTER 5
Identifying variables

CHAPTER 6
Constructing hypotheses

Place of literature review in research
- Bring clarity and focus to your research problem
- Improve your methodology
- Broaden your knowledge base in your research area
- Contextualise your findings

Procedure for reviewing the literature
- Search for existing literature
- Review the literature selected
- Develop a theoretical framework
- Develop a conceptual framework

Writing up the literature reviewed

Summary

CHAPTER three

Reviewing the literature

Place of literature review in research

One of the essential preliminary tasks when you undertake a research study is to go through the existing literature in order to acquaint yourself with the available body of knowledge in your area of interest. The literature review is an integral part of the entire research process and makes a valuable contribution to almost every operational step. It has value even before the first step; that is, when you are merely thinking about a research question that you may want to find answers to through your research journey. In the initial stages of research it helps you to establish the theoretical roots of your study, clarify your ideas and develop your methodology, but later on the literature review serves to enhance and consolidate your knowledge base and helps you to integrate your findings with the existing body of knowledge. Since an important responsibility in research is to compare your findings with those of others, it is here that the literature review plays an extremely important role. During the write-up of your report it helps you to integrate your findings with existing knowledge—that is, to either support or contradict earlier research. The higher the academic level of your research, the more important a thorough integration of your findings with exiting literature becomes.

Reviewing literature can be time-consuming, daunting and frustrating, but it is also rewarding. A literature review has a number of functions:

- It provides a theoretical background to your study.
- It reviews the means by which you establish the links between what you are proposing to examine and what has already been studied. In other words, it helps you to refine your research methodology.
- Through the literature review you are able to show how your findings have contributed to the existing body of knowledge in your profession.
- It enables you to contextualise your findings.

It also helps you to:

1 bring clarity and focus to your research problem;
2 improve your methodology;
3 broaden your knowledge base in your research area.
4 contextualise your findings.

Bring clarity and focus to your research problem

The literature review involves a paradox. On the one hand, you cannot effectively undertake a literature search without some idea of the problem you wish to investigate. On the other hand, the literature review can play an extremely important role in shaping your research problem because the process of reviewing the literature helps you to understand the subject area better and thus helps you to conceptualise your research problem clearly and precisely. It also helps you to understand the relationship between your research problem and the body of knowledge in the area.

Improve your methodology

Going through the literature acquaints you with the methodologies that have been used by others to find answers to research questions similar to the one you are investigating. A literature review tells you if others have used procedures and methods similar to the ones that you are proposing, which procedures and methods have worked well for them, and what problems they have faced with them. By becoming aware of any problems and pitfalls, you will be better positioned to select a methodology that is capable of providing valid answers to your research questions. This will increase your confidence in the methodology you plan to use and will equip you to defend its use.

Broaden your knowledge base in your research area

The most important function of the literature review is to ensure you read widely around the subject area in which you intend to conduct your research study. It is important that you know what other researchers have found in regard to the same or similar questions, what theories have been put forward and what gaps exist in the relevant body of knowledge. When you undertake a research project for a higher degree (that is, an MA or a PhD) you are expected to be an expert in your area of study. A thorough literature review helps to ensure that you fulfil this expectation. Another important reason for doing a literature review is that it helps you to understand how the findings of your study fit into the existing body of knowledge (Martin 1985: 30).

Contextualise your findings

Obtaining answers to your research questions is comparatively easy: the difficult part is examining how your findings fit into the existing body of knowledge. How do answers to your research questions compare with what others have found? What contribution have you been able to make to the existing body of knowledge? How are your findings different from those of others? For you to be able to answer these questions you need to go back to your literature review. It is important to place your findings in the context of what is already known in your field of inquiry.

Procedure for reviewing the literature

If you do not have a specific research problem, you should review the literature in your broad area of interest with the aim of gradually narrowing down to what you want to find out about. After that the literature review should be focused around your research problem. There is a danger in reviewing the literature without having a reasonably specific idea of what you want to study. It can condition your thinking about your study and the methodology you might use, resulting in a less innovative choice of research

problem and methodology than otherwise would have been the case. Hence, you should try to conceptualise your research problem before undertaking your major literature review.

There are four steps involved in conducting a literature review:

1 search for existing literature in your area of study;
2 review the literature selected;
3 develop a theoretical framework;
4 develop a conceptual framework.

The skills required for these tasks are different. Developing theoretical and conceptual frameworks are more difficult than the other tasks.

Search for existing literature

To effectively search for literature in your field of inquiry, it is imperative that you have in mind at least some idea of the broad subject area and of the problem you wish to investigate, in order to set parameters for your search. Next compile a bibliography for this broad area. There are two sources that you can use to prepare a bibliography:

1 books;
2 journals.

The best way to search for a book is to look at your library catalogues. When librarians catalogue a book they also assign to it subject headings that usually are based on *Library of Congress Subject Headings*. If you are not sure, ask your librarian to help you to find the best subject heading for your area. This can save you a lot of time. Publications such as *Book Review Index* can help you to locate books of interest.

There are several sources designed to make your search for journals easier and these can save you enormous time. They are:

1 Indices of journals (e.g. *Humanities Index*);
2 Abstracts of articles (e.g. *ERIC*);
3 Citation indices (e.g. *Social Sciences Citation Index*).

All the above indexing, abstracting and citation services are available in print or on CD-ROM, or are stored on a mainframe computer accessible through the Internet, a world-wide electronic communication system.

In most libraries, information on books, journals, abstracts and so on is stored on computers and CD-ROMs. In each case the information is classified by subject, author and title. You may also have the keywords option (author/keyword; title/keyword; subject/keyword; expert/keyword; or just keywords). What system you use depends upon what is available in your library and what you are familiar with.

There are specially prepared electronic databases in a number of disciplines. These can also be helpful in preparing a bibliography. For example, most libraries carry the electronic databases shown in Table 3.1.

Table 3.1 Some commonly used electronic databases in public health, sociology, education and business studies

Electronic database	*Description*	*Printed equivalent*
ABI/INFORM	Abstracted Business Information contains references to business information worldwide. It covers subjects such as accounting, banking, data processing, economics, finance, health care, insurance, law, management, marketing, personnel, product development, public administration, real estate, taxation and telecommunications.	None
ERIC	ERIC is a database of educational material collected by the Education Resources Information Center of the US Department of Education. It covers subjects such as adult career or vocational education, counselling and personnel services, educational management, primary and early childhood education, handicapped and gifted children, higher education, information resources, language and linguistics, reading and communication, rural education, science, mathematics and environment education, social science education, teacher education, secondary education, evaluation and urban education.	*CIJE: Current Index to Journals in Education*
HEALTHROM	HEALTHROM provides references and some full-text publications on environment, health, HIV/AIDS and communicable diseases, Aboriginal health, clinical medicine, nutrition, alcohol and drug addiction.	None
MEDLINE	MEDLINE contains references to material in the biomedical sciences, including medicine, pharmacology, nursing, dentistry, allied health professions, public health, behavioural sciences, physiotherapy, occupational therapy, medical technology, hospital administration, and basic sciences such as anatomy and physiology.	*Index Medicus*
CINAHL	CINAHL (Cumulative Indices to Nursing and Allied Health Literature) provides access to virtually all English-language nursing journals and primary journals from 13 allied health disciplines including health education, medical records, occupational therapy, physical therapy and radiologic technology.	Cumulative indices to nursing and allied health literature

Select the database most appropriate to your area of study to see if there are any useful references. Of course, any computer database search is restricted to those journals and articles that are already on the database. You should also talk to your research supervisor and other available experts to find out about any additional relevant literature to include in your reading list.

Books

Books, though a central part of any bibliography, have their advantages as well as disadvantages. The main advantage is that the material published in books is usually important and of good quality, and the findings are 'integrated with other research to form a coherent body of knowledge' (Martin 1985: 33). The main disadvantage is that the material is not completely up to date, as it can take a few years between the completion of a work and its publication in the form of a book.

The best way to identify books is to use a computer catalogue. Use the *subject catalogue* or *keywords* option to search for books in your area of interest. Narrow the subject area searched by selecting the appropriate keywords. Look through these titles carefully and identify the books you think are likely to be of interest to you. If you think the titles seem appropriate to your topic, print them out if this facility is available (this will save you time) or note them down on a piece of paper. Be aware that sometimes a title does not provide enough information to decide if a book is going to be of use. To make this decision you may have to search for such books in the library and examine their contents.

When you have selected 10–15 books that you think are appropriate for your topic, examine the bibliography of each. It will save time to photocopy their bibliographies. Go through these bibliographies carefully to identify the books common to several of them. If a book has been referenced by a number of authors, you should include it in your reading list. Prepare a final list of books that you consider essential reading.

Having prepared your reading list, locate these books in your library or borrow them from other sources. Examine their contents to double-check that they really are relevant to your topic. If you find that a book is not relevant to your research, delete it from your reading list. If you find that something in a book's contents is relevant to your topic, make an annotated bibliography. An annotated bibliography contains a brief abstract of the aspects covered in a book and your own notes of its relevance. Be careful to keep track of your references. To do this you can prepare your own card index or use a computer program such as Endnotes or Pro-Cite.

Journals

In the same way, you need to go through the journals in your research area. Journals provide you with the most up-to-date information, even though there is often a gap of two to three years between the completion of a research project and its publication in a journal. You should select as many journals as you possibly can, though the number of journals available depends upon the field of study—certain fields have more journals than others. As with books, you need to prepare a list of the journals you want to examine for identifying literature relevant to your study. This can be done in a number of ways. You can:

- locate the hard copies of the journals that are appropriate to your study;
- look at citation or abstract indices to identify and/or read the abstracts of such articles;
- search electronic databases;
- use the Internet.

Whichever method you choose, first identify the journals that you want to look at in more detail for your review of the literature. The next step is to make preparations to go through them.

If you have been able to identify any useful journals and articles, prepare a list of those you want to examine, by journal. Select one of these journals and, starting with the latest issue, examine its contents page to see if there is an article of relevance to your research topic. If you feel that a particular article is of interest to you, read its abstract. If you think you are likely to

use it, depending upon your financial resources, either photocopy it, or prepare a summary and record its reference for later use.

Review the literature selected

Now that you have identified several books and articles as useful, the next step is to start reading them critically to pull together themes and issues that are associated. If you do not have a theoretical framework of themes in mind to start with, use separate sheets of paper for each article or book. Once you develop a rough framework, slot the findings from the material so far reviewed into that framework, using a separate sheet of paper for each theme of that framework. As you read further, go on slotting the information where it logically belongs under the themes so far developed. You may need to add more themes as you go. In doing so, read critically with particular reference to the following aspects:

- Note whether the knowledge relevant to your theoretical framework has been confirmed beyond doubt.
- Note the theories put forward, the criticisms of these and their basis, the methodologies adopted (study design, sample size and its characteristics, measurement procedures, etc.) and the criticisms of them.
- Examine to what extent the findings can be generalised to other situations.
- Notice where there are significant differences of opinion among researchers and give your opinion about the validity of these differences.
- Ascertain the areas in which little or nothing is known—the gaps that exist in the body of knowledge.

Develop a theoretical framework

Examining the literature can be a never-ending task, but as you have limited time it is important to set parameters by reviewing the literature in relation to some main themes pertinent to your research topic. As you start reading the literature, you will soon discover that the problem you wish to investigate has its roots in a number of theories that have been developed from different perspectives. The information obtained from different books and journals now needs to be sorted under the main themes and theories, highlighting agreements and disagreements among the authors and identifying the unanswered questions or gaps. You will also realise that the literature deals with a number of aspects that have a direct or indirect bearing on your research topic. Use these aspects as a basis for developing your theoretical framework. Your review of the literature should sort out the information, as mentioned earlier, within this framework. Unless you review the literature in relation to this framework, you will not be able to develop a focus in your literature search: that is, your theoretical framework provides you with a guide as you read. This brings us to the paradox mentioned previously: until you go through the literature you cannot develop a theoretical framework and until you have developed a theoretical framework, you cannot effectively review the literature. The solution is to read some of the literature then attempt to develop a framework, even a loose one, within which you can organise the rest of the literature you read. As you read more about the area,

you are likely to change the framework. However, without it, you will get bogged down in a great deal of unnecessary reading and note-taking that may not be relevant to your study.

Literature pertinent to your study may deal with two types of information:

1 universal;
2 more specific (i.e. local trends or a specific program).

In writing about such information you should start with the general information, gradually narrowing it down to the specific.

Look at the example in Figure 3.1.

Figure 3.1 Developing a theoretical framework—the relationship between mortality and fertility

If you want to study the relationship between mortality and fertility, you should review literature about:

- *fertility*—trends, theories, some of the indices and critiques of them, factors affecting fertility, methods of controlling fertility, factors affecting acceptance of contraceptives, and so on;
- *mortality*—factors affecting mortality, mortality indices and their sensitivity in measuring change in mortality levels of a population, trends in mortality, and so on; and, most importantly
- *the relationship between fertility and mortality*—theories that have been put forward to explain the relationship, implications of the relationship.

Out of this literature review you need to develop the theoretical framework for your study. Primarily this should revolve around theories that have been put forward about the relationship between mortality and fertility. You will discover that a number of theories has been proposed to explain this relationship. For example, it has been explained from economic, religious, medical and psychological perspectives. Within each perspective several theories have been put forward: 'insurance theory', 'fear of non-survival', 'replacement theory', 'price theory', 'utility theory', 'extra' or 'hoarding theory' and 'risk theory'.

Your literature review should be written under the following headings, with most of the review involving the examination of the relationships between fertility and mortality:

- fertility theories;
- the theory of demographic transition;
- trends in fertility (global, and then narrow it to national and local levels);
- methods of contraception (their acceptance and effectiveness);
- factors affecting mortality;
- trends in mortality (and their implications);
- measurement of mortality indices (their sensitivity);
- *relationships between fertility and mortality* (different theories such as 'insurance', 'fear of non-survival', 'replacement', 'price', 'utility', 'risk' and 'hoarding').

Develop a conceptual framework

The conceptual framework stems from the theoretical framework and concentrates, usually, on one section of that theoretical framework which becomes the basis of your study. The latter consists of the theories or issues in which your study is embedded, whereas the former describes the aspects you selected from the theoretical framework to become the basis of your inquiry. The conceptual framework is the basis of your research problem. For instance, in the example cited in Figure 3.1, the theoretical framework includes all the theories that have been put forward to explain the relationship between fertility and mortality. However, out of these, you may be planning to test only one, say, the fear of non-survival. Hence the conceptual framework grows out of the theoretical framework and relates to the specific research problem concerning the fear of non-survival theory.

Writing up the literature reviewed

Now, all that remains to be done is to write about the literature you have reviewed. As mentioned in the beginning of this chapter, the broad two functions of a literature review are (1) to provide a theoretical background to your study and (2) to enable you to contextualise your findings in relation to the existing body of knowledge in addition to refining your methodology. The content of your literature review reflects these two purposes. In order to fulfil the first purpose, you identify and describe various theories relevant to your field; and specify gaps in existing knowledge in the area, recent advances in the area of study, current trends and so on. In order to comply with the second function you integrate your results with specific and relevant findings from the existing literature by comparing the two for confirmation or contradiction.

While reading the literature for theoretical background of your study, you will realise that certain themes have emerged. List the main ones, converting them into subheadings. These subheadings should be precise, descriptive of the theme in question, and follow a logical progression. Now, under each subheading, record the main findings with respect to the theme in question, highlighting the reasons for and against an argument if they exist, and identifying gaps and issues. Some people write up the entire literature review in one section, entitled 'Review of the literature' or 'The literature review', without subheadings. The author strongly suggests that you write your literature review under subheadings. Figure 3.2 shows the subheadings used to describe the themes in a literature review for a study entitled *Intercountry adoption in Western Australia*, conducted by the author.

The second broad function of the literature review—contextualising the findings of your study—requires you to very systematically compare your findings with those made by others. Quote from these studies to show how

your findings contradict, confirm or add to them. It places your findings in the context of what other have found out. This function is undertaken when writing about your findings, that is, after analysis of your data.

Figure 3.2 Sample of outline of a literature review

Intercountry adoption in Western Australia

(A profile of adoptive families)

The literature was reviewed under the following themes:

- Introduction (*introductory remarks about adoption*)
- History and philosophy of adoption
- Reasons for adoption
- Trends in adoption (*global and national*)
- Intercountry adoption
- History of intercountry adoption in Western Australia
- Trends in intercountry adoption in Western Australia
- The Adoption Act in Western Australia
- The adoption process in Western Australia
- Problems and issues in adoption
- Gaps in the literature (*in this case it was a lack of information about those parents who had adopted children from other countries that became the basis of the study*)

SUMMARY

Reviewing the literature is a continuous process. It begins before a research problem is finalised and continues until the report is finished. There is a paradox in literature review: you cannot undertake an effective literature review unless you have formulated a research problem, yet your literature search plays an extremely important role in helping you to formulate your research problem. The literature review brings clarity and focus to your research problem, improves your methodology and broadens your knowledge base.

Reviewing the literature involves a number of steps: searching for existing literature in your area of study; reviewing the selected literature; using it to develop a theoretical framework from which your study emerges and also using it to develop a conceptual framework which will become the basis of your investigation. The main sources for identifying literature are books and journals. There are several sources which can provide information about locating relevant journals.

The research problem

The importance of formulating a research problem

Sources of research problems

Considerations in selecting a research problem

Steps in the formulation of a research problem

The formulation of objectives

Establishing operational definitions

Summary

CHAPTER four

Formulating a research problem

The central aim of this chapter is to detail the process of problem formulation. However, the specific process that you are likely to adopt depends upon:

- your expertise in research methodology;
- your knowledge of the subject area;
- your understanding of the issues to be examined;
- the extent to which the focus of your study is predetermined.

If you are not very familiar with the research process and/or do not have a very specific idea about what is to be researched, you need to follow every step detailed in this chapter. However, more experienced researchers can take a number of short cuts. The process outlined here assumes that you have neither the required knowledge of the process of formulating a research problem nor a specific idea about what is to be researched.

The research problem

If you have a specific idea for the basis of your inquiry, you do not need to go through this chapter. However, you should make sure that your idea is researchable as not all problems lend themselves to research methodologies. Broadly speaking, any question that you want answered and any assumption or assertion that you want to challenge or investigate can become a research problem or a research topic for your study. However, it is important to remember that not all questions can be transformed into research problems and some may prove to be extremely difficult to study. According to Powers, Meenaghan & Twoomey (1985: 38), 'Potential research questions may occur to us on a regular basis, but the process of formulating them in a meaningful way is not at all an easy task'. As a newcomer it might seem easy to formulate a problem but it requires a considerable knowledge of both the subject area and research methodology. Once you examine a question more closely you will soon realise the complexity of formulating an idea into a problem which is researchable. 'First identifying and then specifying a research problem might seem like research tasks that ought to be easy and quickly accomplished. However, such is often not the case' (Yegidis & Weinback 1991: 35).

It is essential for the problem you formulate to be able to withstand scrutiny in terms of the procedures required to be undertaken. Hence you should spend considerable time in thinking it through.

The importance of formulating a research problem

The formulation of a research problem is the first and most important step of the research process. It is like the identification of a destination before undertaking a journey. As in the absence of a destination, it is impossible to identify the shortest—or indeed any—route, in the absence of a clear research problem, a clear and economical plan is impossible. A research problem is like the foundation of a building. The type and design of the building is dependent upon the foundation. If the foundation is well

designed and strong you can expect the building to be also. The research problem serves as the foundation of a research study: if it is well formulated, you can expect a good study to follow. According to Kerlinger,

> If one wants to solve a problem, one must generally know what the problem is. It can be said that a large part of the problem lies in knowing what one is trying to do (1986: 17).

You must have a clear idea with regard to what it is that you want to find out **about** and not what you think you must find.

A research problem may take a number of forms, from the very simple to the very complex. The way you formulate a problem determines almost every step that follows: the type of study design that can be used; the type of sampling strategy that can be employed; the research instrument that can be used or developed; and the type of analysis that can be undertaken. The formulation of a problem is like the 'input' into a study, and the 'output'—the quality of the contents of the research report and the validity of the associations or causation established—is entirely dependent upon it. Hence the famous saying about computers—'garbage in, garbage out'—is equally applicable to a research problem.

In the beginning you may become more confused but this is normal and a sign of progression. *Remember: confusion is often but a first step towards clarity*. Take time over formulating your problem, for the clearer you are about your research problem/question, the easier it will be for you later on. *Remember, this is the most crucial step.*

Sources of research problems

This section is of particular relevance if you have not yet selected a research topic and do not know where to start. If you have already selected your topic or question, go to the next section.

Most research in the humanities revolves around four *P*s:

- People;
- Problems;
- Programs;
- Phenomena.

The emphasis on a particular '*P*' may vary from study to study but generally, in practice, most research studies are based upon at least a combination of two *P*s. You may select a group of individuals (a group or a community as such—'people'), either to examine the existence of certain issues or problems relating to their lives, to ascertain attitude of a group of people towards an issue ('problem'), to establish existence of a regularity ('phenomenon') or to evaluate the effectiveness of an intervention ('program'). Your focus may be the study of an issue, an association or a phenomenon *per se*; for example, the relationship between unemployment and street crime, smoking and cancer or fertility and mortality, which is done on the basis of information collected from individuals, groups,

communities or organisations. The emphasis in these studies is on exploring, discovering or establishing associations or causation. Similarly, you can study different aspects of a program: its effectiveness, its structure, the need for it, consumers' satisfaction with it, and so on. In order to ascertain these you collect information from people. The 'people' provide you with the 'study population', whereas the other three *P*s furnish the 'subject areas'. Your study population—individuals, groups and communities—is the people from whom the information is collected. Your subject area is a 'problem', 'program' or 'phenomenon' about which the information is collected. A closer look at any academic discipline or occupational field will show that most research revolves around the four *P*s.

Every research study has two aspects:

1 the study population;
2) the subject area.

Table 4.1 shows aspects of a research problem.

Table 4.1 Aspects of a research problem

Aspects of a study	***About***	***Study of***	
Study population	People	Individuals, organisations, groups, communities	They provide you with the required information or you collect information from or about them
Subject area	Problem	Issues, situations, associations, needs, population composition, profiles, etc.	Information that you need to collect to find answers to your research questions
	Program	Contents, structure, outcomes, attributes, satisfaction, consumers, service providers, etc.	
	Phenomenon	Cause-and-effect relationships, the study of a phenomenon itself, etc.	

You can study a problem, a program or a phenomenon in any academic field or from any professional perspective. For example, you can measure the effectiveness of a program in the field of health, education, social work, industrial management, public health, nursing, health promotion or a welfare program, or you can look at a problem from a health, business or welfare perspective. Similarly you can gauge consumers' opinions about any aspect of a program in the above fields.

Examine your own academic discipline or professional field in the context of the four *P*s in order to identify anything that looks interesting. Consider some of the aspects identified under 'Study of' in Table 4.1 against problem, program or phenomenon for a possible research topic. For example, if you are a student in the health field there are an enormous

number of issues, situations and associations within each subfield of health that you could examine. Issues relating to the spread of a disease, drug rehabilitation, an immunisation program, the effectiveness of a treatment, the extent of consumers' satisfaction or issues concerning a particular health program can all provide you with a range of research problems. Similarly, in education there are several issues: students' satisfaction with a teacher, attributes of a good teacher, the impact of the home environment on the educational achievement of students, and supervisory needs of postgraduate students in higher education. Any other academic or occupational field can similarly be dissected into subfields and examined for a potential research problem. Most fields lend themselves to the above categorisation even though specific problems and programs vary markedly from field to field.

Considerations in selecting a research problem

When selecting a research problem/topic there are a number of considerations to keep in mind. These help to ensure that your study will be manageable and that you will remain motivated. These considerations are interest, magnitude, measurement of concepts, level of expertise, relevance, availability of data and ethical issues.

- **Interest**—interest should be the most important consideration in selecting a research problem. A research endeavour is usually time-consuming, and involves hard work and possibly unforeseen problems. If you select a topic which does not greatly interest you, it could become extremely difficult to sustain the required motivation, and hence its completion as well as the amount of time taken could be affected.
- **Magnitude**—you should have sufficient knowledge about the research process to be able to visualise the work involved in completing the proposed study. Narrow the topic down to something manageable, specific and clear. It is extremely important to select a topic that you can manage within the time and resources at your disposal. Even if you are undertaking a descriptive study, you need to carefully consider its magnitude.
- **Measurement of concepts**—if you are using a concept in your study, make sure you are clear about its indicators and their measurement. For example, if you plan to measure the effectiveness of a health promotion program, you must be clear as to what determines effectiveness and how it will be measured. Do not use concepts in your research problem that you are not sure how to measure. This does not mean you cannot develop a measurement procedure as the study progresses. While most of the developmental work will be done during your study, it is imperative that you are reasonably clear about the measurement of these concepts at this stage.
- **Level of expertise**—make sure you have an adequate level of expertise for the task you are proposing. Allow for the fact that you will learn during the study and may receive help from your research supervisors and others, but remember you need to do most of the work yourself.

- **Relevance**—select a topic that is of relevance to you as a professional. Ensure that your study adds to the existing body of knowledge, bridges current gaps or is useful in policy formulation. This will help you to sustain interest in the study.
- **Availability of data**—if your topic entails collection of information from secondary sources (office records, client records, census or other already-published reports, etc.) before finalising your topic, make sure that these data are available and in the format you want.
- **Ethical issues**—another important consideration in formulating a research problem is the ethical issues involved. In the course of conducting a research study, the study population may be adversely affected by some of the questions (directly or indirectly); deprived of an intervention; expected to share sensitive and private information; or expected to be simply experimental 'guinea pigs'. How ethical issues can affect the study population and how ethical problems can be overcome should be thoroughly examined at the problem-formulation stage.

Steps in the formulation of a research problem

The formulation of a research problem is the most crucial part of the research journey on which the quality of the entire project depends. Yet the available books offer very little by way of specific guidance. This task is largely left either to the teachers of research methodology or to students like you to learn themselves. One of the strengths of this book is that it offers a beginner a very specific set of step-by-step guidelines in one place.

The process of formulating a research problem consists of a number of steps. Working through these steps presupposes a reasonable level of knowledge in the broad subject area within which the study is to be undertaken. A brief review of the relevant literature helps enormously in broadening this knowledge base. Without such knowledge it is difficult to clearly and adequately 'dissect' a subject area.

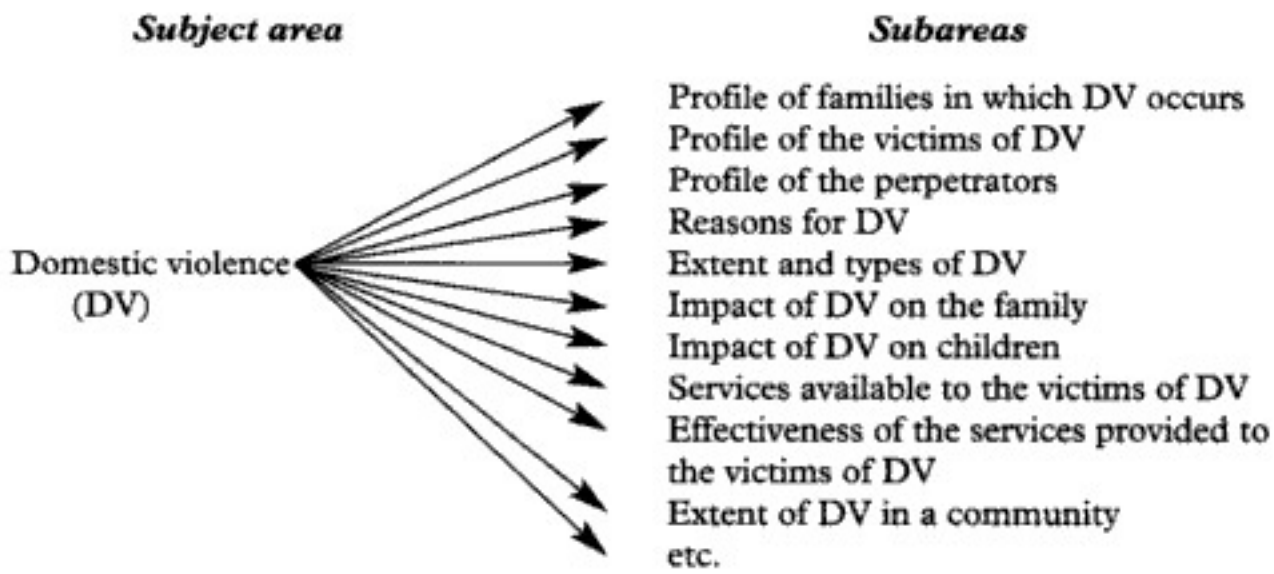
If you do not know what specific research topic, idea or issue you want to research (which is not uncommon among students) first go through the following two steps:

Steps 1 **Identify a broad field or subject area of *interest* to you.** Ask yourself, 'What is it that really interest me as a professional'? In the author's opinion, it is a good idea to think about the field in which you would like to work after graduation. This will help you to find an interesting topic, and one which may be of use to you in the future. For example, if you are a social work student, inclined to work in the area of youth welfare, refugees or domestic violence after graduation, you might take to research in one of these areas. Or if you are studying marketing you might be interested in researching consumer behaviour. Or, as a student of public health, intending to work with patients who

have HIV/AIDS, you might like to conduct research on a subject area relating to HIV/AIDS. As far as the research journey goes, these are the broad research areas. It is imperative that you identify one of interest to you before undertaking your research journey.

Step 2 ***Dissect* the broad area into subareas.** At the onset, you will realise that all the broad areas mentioned above—youth welfare, refugees, domestic violence, consumer behaviour and HIV/AIDS—have many aspects. Take domestic violence for example. There are many aspects and issues in the area of domestic violence. Figure 4.1 shows some of its many aspects.

Figure 4.1 Dissecting the subject area of domestic violence into subareas



Similarly, you can select any subject area from other fields such as community health or consumer research and go through this dissection process. In preparing this list of subareas you should also consult others who have some knowledge of the area and the literature in your subject area. Once you have developed an exhaustive list of the subareas from various sources, you proceed to the next stage where you select what will become the basis of your inquiry.

Step 3 ***Select* what is of most interest to you.** It is neither advisable nor feasible to study all subareas. Out of this list, select issues or subareas about which you are passionate. This is because your interest should be the most important determinant for selection, even though there are other considerations which have been discussed in the previous section, 'Considerations in selecting a research problem'. One way to decide what interests you most is to start with the process of elimination. Go through your list and delete all those subareas in which you are not very interested. You will find that towards the end of this process, it will become very difficult for you to delete anything further. You need to continue

until you are left with something that is *manageable* considering the time available to you, your level of expertise and other resources needed to undertake the study. Once you are confident that what you have selected you are passionate about and can manage, you are ready to go to the next step.

Step 4 **Raise research questions.** At this step you ask yourself, 'What is it that I want to find out about in this subarea'? Within your chosen subarea, first list whatever questions you want to find answers to. If you find yourself in a situation where you can think of many questions, too many to be manageable, again go through a process of elimination, as you did in Step 3.

Step 5 **Formulate objectives.** Formulate your main objectives and your subobjectives (see the following section on formulation of objectives). Your objectives grow out of your research questions. The main difference between objectives and research questions is the way in which they are written. Research questions are obviously that—questions. Objectives transform these questions into behavioural aims by using action-oriented words such as 'to find out', 'to determine', 'to ascertain' and 'to examine'. Some researchers prefer to reverse the process; that is, they start from objectives and formulate research questions from them. Some researchers are satisfied only with research questions, and do not formulate objectives at all. If you prefer to have only research questions or only objectives, this is fine but keep in mind the requirements of your institution for research proposals.

Step 6 **Assess your objectives.** Now examine your objectives to ascertain the feasibility of achieving them through your research endeavour. Consider them in the light of the time, resources (financial and human) and technical expertise at your disposal.

Step 7 **Double-check.** Go back and give final consideration to whether or not you are sufficiently interested in the study, and have adequate resources to undertake it. Ask yourself, 'Am I really enthusiastic about this study', and 'Do I really have enough resources to undertake it'? Answer these questions thoughtfully and realistically. If your answer to one of them is 'no', re-assess your objectives.

Figures 4.2 to 4.4 operationalise steps 1–7 with examples from different academic disciplines (health, social work/social sciences and community development).

So far we have focused on the basis of your study, the *research problem*. But every study in social sciences has a second element, *the study population*, from whom the required information to find answers to your research questions is obtained. As you narrow the research problem, similarly you need to decide very specifically who constitutes your study population, in order to select the appropriate respondents.

Figure 4.2 Steps in formulating a research problem—alcoholism

Example 1: Suppose you want to conduct a study in the area of alcoholism. In formulating your research problem take the following steps.

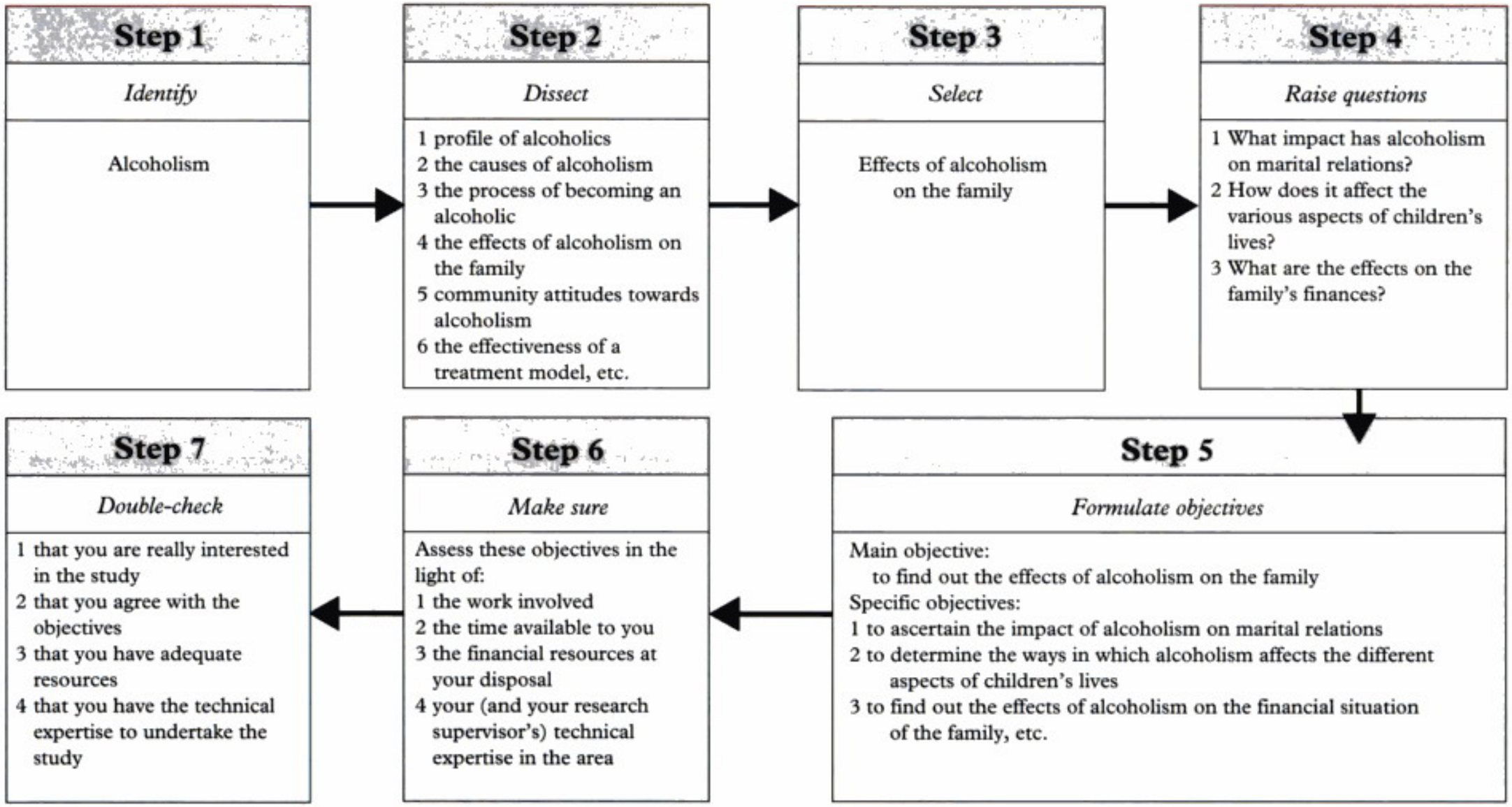


Figure 4.3 Formulating a research problem—the relationship between fertility and mortality

Example 2: Suppose you want to study the relationship between fertility and mortality. Follow these steps.

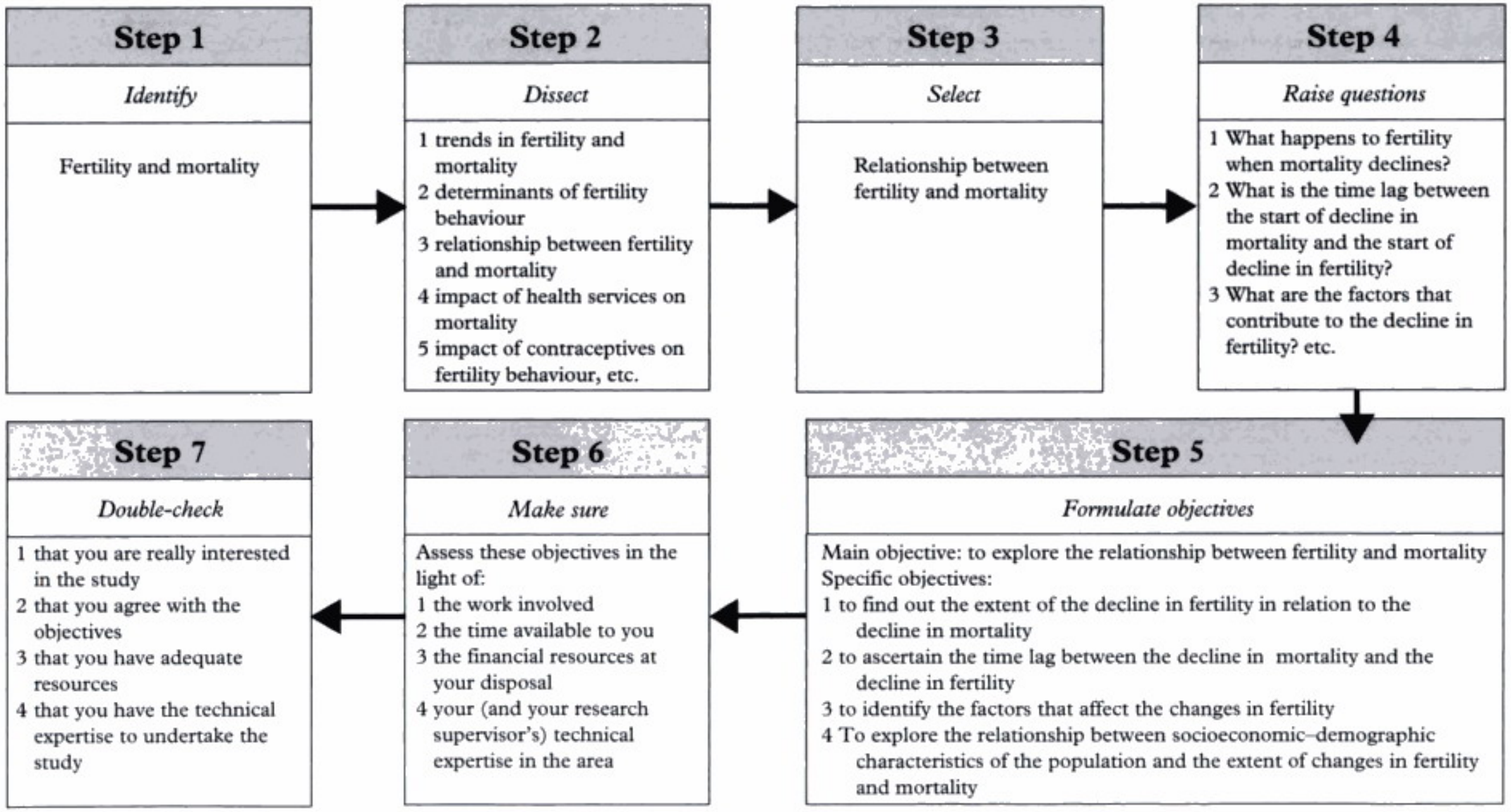


Figure 4.4 Narrowing a research problem—health

Example 3: Suppose you want to conduct a study in the area of health. Follow these steps.

Step 1

Identify

Health

Step 2

Dissect

1 health services provided to the community
2 effectiveness of the services
3 cost of the services
4 health insurance schemes available to people
5 training of health professionals
6 adherence to ethics in health practices
7 attitude of the consumers towards health services
8 community responsiveness in the delivery of health services, etc.

Step 3

Select

Community responsiveness in the delivery of health services

Step 4

Raise questions

1 How do the health administrators, planners, service providers and consumers define community responsiveness?
2 How can community responsiveness be achieved?
3 What indicators can be used to evaluate the effectiveness of community responsiveness strategies?

Step 5

Formulate objectives

Main objective: to evaluate the effectiveness of community responsiveness strategies in the delivery of health services
Specific objectives:
1 to find out the understanding of the concept 'community responsiveness' among health administrators, planners, service providers and service consumers
2 to identify the strategies to implement the concept of community responsiveness in health services
3 to develop a set of indicators to evaluate the effectiveness of the strategies used in implementation of community responsiveness

Step 6

Make sure

Assess your objectives in the light of:
1 work involved
2 time available to you
3 financial resources at your disposal
4 your and (your research supervisor's) technical expertise in the area

Step 7

Double-check

Ask yourself:
1 Are you really interested in the study?
2 Do you agree with the objectives?
3 Do you have adequate resources?

The formulation of objectives

Objectives are the goals you set out to attain in your study. Since these objectives inform a reader of what you want to achieve through the study, it is extremely important to word them clearly and specifically.

Objectives should be listed under two headings:

- main objectives;
- subobjectives.

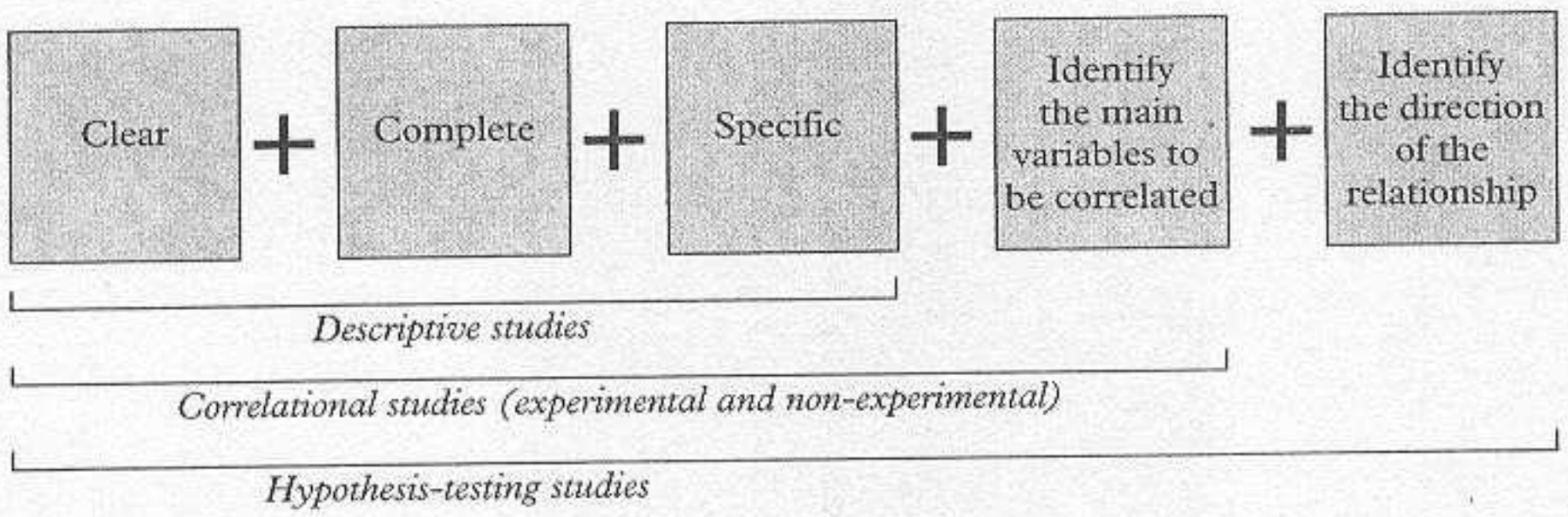
The main objective is an overall statement of the thrust of your study. It is also a statement of the main associations and relationships that you seek to discover or establish. The subobjectives are the specific aspects of the topic that you want to investigate within the main framework of your study.

Subobjectives should be numerically listed. They should be worded clearly and unambiguously. Make sure that each subobjective contains only one aspect of the study. Use action-oriented words or verbs when writing your objectives. The objectives should start with words such as 'to determine', 'to find out', 'to ascertain', 'to measure' and 'to explore'.

The way the main and subobjectives are worded determines how your research is classified (e.g. descriptive, correlational or experimental). In other words, the wording of your objectives determines the type of research design you need to adopt to achieve them. Hence, be careful about the way you word your objectives.

Irrespective of the type of research, the objectives should be expressed in such a way that the wording clearly, completely and specifically communicates to your readers your intention. There is no place for ambiguity, non-specificity or incompleteness, either in the wording of your objectives or in the ideas they communicate. Figure 4.5 displays the characteristics of the wording of objectives in relation to the type of research study.

Figure 4.5 Characteristics of objectives



If your study is primariiy descriptive, your main objective should clearly describe the major focus of your study, even mentioning the organisation and its location unless these are to be kept confidential (e.g. to describe the types of treatment program provided by ... [name of the organisation] to alcoholics in ... [name of the place] ... *or* to find out the opinion of the community about the health services provided by ... [name of the health centre/department] in ... [name of the place] ...). Identification of the

organisation and its location is important as the services may be peculiar to the place and the organisation and may not represent the services provided by others to similar populations.

If your study is correlational in nature, in addition to the above three properties, the wording of the main objective should include the main variables being correlated (e.g. to ascertain the *impact of migration* on *family roles* or to compare the effectiveness of *different teaching methods* on the *comprehension of students*).

If the overall thrust of your study is to test a hypothesis, the wording of main objectives, in addition to the above, should indicate the direction of the relationship being tested (e.g. to ascertain if an *increase in youth unemployment* will *increase the incidence of street crime*, or to demonstrate that the provision of maternal and child health services to Aboriginal people in rural Australia will *reduce infant mortality*).

Establishing operational definitions

As mentioned earlier, in every study there are two components: the subject area and the study population (discussed in 'Sources of research problems' earlier in this chapter). The main aim of formulating a research problem is to clearly and precisely define the research problem. In defining the problem you may use certain words or items that are difficult to measure and/or the understanding of which may vary from respondent to respondent. In a research study it is important to develop, define or establish a set of rules, indicators or yardsticks in order to clearly establish the meaning of such words/items. On the other hand, it is sometimes also important to define clearly the study population from which you need to obtain the required information. The following example studies help to explain this. The main objectives are:

- to find out the number of *children* living below the *poverty line* in Australia;
- to ascertain the impact of immigration on *family roles* among *immigrants*;
- to measure the *effectiveness* of a retraining program designed to help *young people*.

Although these objectives clearly state the main thrust of the studies, they are not specific in terms of the main variables to be studied and the study populations. You cannot count the number of children living below the poverty line until you decide what constitutes the poverty line and how to determine it; you cannot find out the impact of immigration on family roles unless you identify which roles constitute family roles; and you cannot measure effectiveness until you define what effectiveness is. On the other hand, it is equally important to decide exactly what you mean by 'children', 'immigrants' or 'young'. Up to what age will you consider a person to be a child (i.e. 5, 10, 15 or 18)? Who would you consider young? A person 15 years of age, 20, 25 or 30? Who would you consider to be an immigrant? A person who immigrated 40, 20 or

5 years ago? In addition, are you going to consider immigrants from every country or only a few?

In many cases you need to develop operational definitions for the variable you are studying and for the population that becomes the source of the information for your study. Table 4.2 shows the concepts and the population groups to be operationalised for the above examples.

In a research study you need to define these clearly in order to avoid ambiguity and confusion. This is achieved through the process of developing operational/working definitions. You need to develop operational definitions for the major concepts you are using in your study and develop a framework for the study population enabling you to select appropriate respondents.

Table 4.2 Operationalisation of concepts and the study populations

Study	*Concept to be studied*		*Population to be studied*	
	Concepts	Issues	Study populations	Issues
1	Poverty line	What constitutes 'poverty line'?	Children	Who would you consider a child?
2	Family roles	What constitutes 'family roles'?	Immigrants	Who would you consider an immigrant?
3	Effectiveness	What constitutes 'effectiveness'?	The young	Who would you consider a young person?
You must	Operationalise the concepts: define in practical, observable and measurable terms 'poverty line', 'family roles' and 'effectiveness'		Operationalise the study population: define in identifiable terms 'children', 'immigrants' and 'young'.	

Operational definitions may differ from dictionary definitions as well as from day-to-day meanings. These meanings may not be helpful in either identifying your study population or the concepts you are studying. Though in daily life you often use words such as 'children', 'youth' and 'immigrant' loosely, you need to be more specific when using them in a research study. You should work through your own definition.

Operational definitions give an operational meaning to the study population and the concepts used. It is only through making your procedures explicit that you can validly describe, explain, verify and test. It is important to remember that there are no rules for deciding if an operational definition is valid. Your arguments must convince others about the appropriateness of your definitions.

SUMMARY

The formulation of a research problem is the most important step in the research process. It is the foundation, in terms of design, on which you build the whole study. Any defects in it will adversely affect the validity and reliability of your study.

There are no specific guidelines but the model suggested in this chapter could serve as a useful framework for the beginner. The seven-step model is operational in nature and follows a logical sequence that takes the beginner through the complexities of formulating a research problem in a simple and easy-to-understand manner.

It is important to articulate the objectives of your study clearly. Objectives should be specific and free from ambiguity, and each one should relate to only one aspect of the study. They should be under two headings: main objective and subobjectives. Use action-oriented words when writing your objectives.

CHAPTER five

Identifying variables

If it exists, it can be measured (Babbie 1989: 105).

In the process of formulating a research problem there are two important considerations: the use of concepts and the construction of hypotheses. Concepts are highly subjective as their understanding varies from person to person and therefore, as such, may not be measurable. In a research study it is important that the concepts used should be operationalised in measurable terms so that the extent of variation in respondents' understanding is reduced if not eliminated. Techniques about how to operationalise concepts, and knowledge about variables, play an important role in reducing this variability. Their knowledge, therefore, is important in 'fine tuning' your research problem.

The definition of a variable

Whether we accept it or not, we all make value judgements constantly in our daily lives: 'This food is *excellent*'; 'I could not sleep *well* last night'; 'I do not *like* this'; and 'I think this is *wonderful*'. These are all judgements based upon our *own* preferences, indicators or assessment. Because these explain feelings or preferences, the basis on which they are made may vary markedly from person to person. There is no uniform yardstick with which to measure them. A particular food may be judged 'excellent' by one person but 'awful' by another, and something else could be wonderful to one person but ugly to another. When people express these feelings or preferences, they do so on the basis of certain criteria in their minds. If you take the time to question them you will discover that their judgement is based upon indicators that lead them to conclude and express that opinion.

Let us take the same issues at another level:

- 'This program is *effective*'.
- 'This program is *not effective*'.
- 'We are providing a *quality* service to our clients'.
- 'This is a *waste of time*'.
- 'In this institution women are *discriminated* against'.
- 'There is no *accountability* in this office'.
- 'This product is not doing *well*'.

These are not preferences *per se*; these are judgements that require a sound basis on which to proclaim. For example, if you want to find out if a program is effective, if a service is of quality or if there is discrimination, you need to be careful that such judgements have a rational and sound basis. This warrants the use of a measuring mechanism and it is in the process of measurement that knowledge about variables plays an important role.

An image, perception or concept that is capable of measurement—hence capable of taking on different values—is called a ***variable***. In other words, a concept that can be measured is called a variable. According to Kerlinger,

'A variable is a property that takes on different values. Putting it redundantly, a variable is something that varies ... A variable is a symbol to which numerals or values are attached' (1986: 27). Black and Champion define a variable as 'rational units of analysis that can assume any one of a number of designated sets of values' (1976: 34). A concept that can be measured on any one of the four types of measurement scale, which have varying degrees of precision in measurement, is called a variable (measurement scales are discussed later in this chapter).

However, there are some who believe that scientific methods are incapable of measuring feelings, preferences, values and sentiments. In the author's opinion most of these things can be measured, though there are situations where such feelings or judgements are incapable of direct measurement (but can be measured indirectly). These feelings and judgements are based upon observable behaviours in real life, though the extent to which the behaviours reflect their judgements may vary from person to person. Cohen and Nagel express their opinion in the following words:

> There are, indeed, a great many writers who believe that scientific method is inherently inapplicable to such judgements as estimation or value, as 'This is beautiful', 'This is good' or 'This ought to be done' ... all judgements of the latter type express nothing but feelings, tastes or individual preferences, such judgements cannot be said to be true or false (except as descriptions of the personal feelings of the one who utters them) ... Almost all human discourse would become meaningless if we took the view that every moral or aesthetic judgement is no more true or false than any other (1966: 352).

The difference between a concept and a variable

Concepts are mental images or perceptions and therefore their meanings vary markedly from individual to individual, whereas variables are measurable, of course with varying degrees of accuracy. Measurability is the main difference between a concept and a variable. A concept cannot be measured whereas a variable can be subjected to measurement by crude/refined or subjective/objective units of measurement. Concepts are subjective impressions—their understanding may differ from person to person—which, if measured, would cause problems in comparing responses. According to Young,

> Each collaborator must have the same understanding of the concepts if the collaborative data are to be similarly classified and the findings pooled and tested, or reproduced. Classification and comparison demand uniform and precise definitions of categories expressed in concepts (1966: 18).

It is therefore important for the concepts to be converted into variables as they can be subjected to measurement even though the degree of precision with which they can be measured varies from scale to scale. Table 5.1 shows the difference between a concept and a variable.

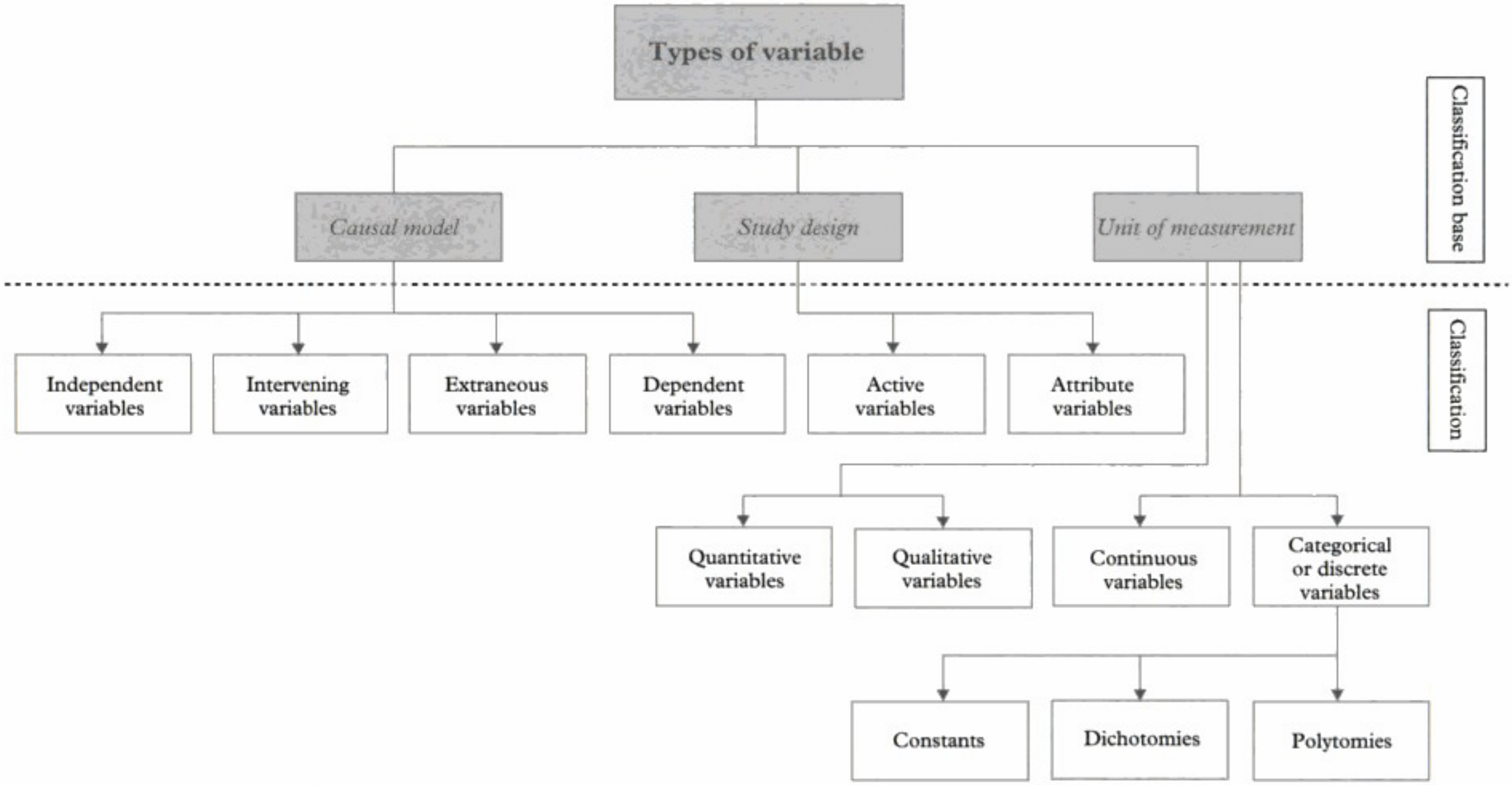
Table 5.1 The difference between concepts and variables

Concept	*Variable*
• effectiveness • satisfaction • impact • excellent • high achiever • self-esteem • rich • domestic violence • extent and pattern of alcohol consumption etc.	• gender (male/female) • attitude • age (*x* years, *y* months) • income ($ ___ per year) • weight (___ kg) • height (___ cm) • religion (Catholic, Protestant, Jew, Muslim) etc.
—Subjective impression —No uniformity as to its understanding among different people —As such cannot be measured	—Measurable though the degree of precision varies from scale to scale and from variable to variable (e.g., attitude—subjective, income—objective)

Concepts, indicators and variables

If you are using a concept in your study, you need to consider its operationalisation—that is, how it will be measured. In most cases, to operationalise a concept you first need to go through the process of identifying indicators—a set of criteria reflective of the concept—which can then be converted into variables. The choice of indicators for a concept might vary with the researcher but those selected must have a logical link with the concept. Some concepts, such as 'rich', can easily be converted into indicators and then variables. For example, to decide objectively if a person is 'rich', one first needs to decide upon the indicators of richness. Assume that we decide upon income and assets as the indicators. Income is also a variable since it can be measured in dollars; therefore, you do not need to convert this into a variable. Although the assets owned by an individual are indicators of his/her 'richness', they still belong to the category of concepts. You need to look further at the indicators of assets. For example, house, boat, car and investments are indicators of assets. Converting the value of each one into dollars will give the total value of the assets owned by a person. Next, fix a level, based upon available information on income distribution and an average level of assets owned by members of a community, which acts as the basis for classification. Then analyse the information on income and the total value of the assets to make a decision about whether the person should be classified as 'rich'. The operationalisation of other concepts, such as the 'effectiveness' or 'impact' of a program, may prove more difficult. Table 5.2 shows some examples that will help you to understand the process of converting concepts into variables.

Figure 5.1 Types of variable



Note: Classification across a classification base is not mutually exclusive but classification within a classification base is. Within a study an independent variable can be an active variable, or a quantitative or a qualitative variable and it can also be a continuous or a categorical variable but it cannot be a dependent, an extraneous or an intervening variable.

Types of variable

A variable can be classified in a number of ways. The classification developed here results from looking at variables in three different ways (see Figure 5.1 on the previous page):

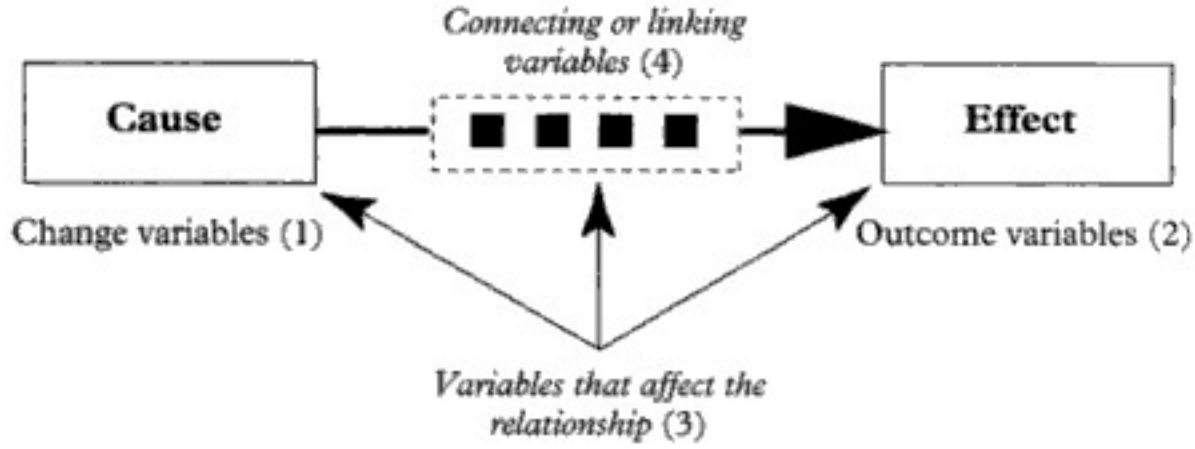
- the causal relationship;
- the design of the study;
- the unit of measurement.

From the viewpoint of causation

In studies that attempt to investigate a causal relationship or association, four sets of variables may operate (see Figure 5.2):

1 **change** variables, which are responsible for bringing about change in a phenomenon;
2 **outcome** variables, which are the effects of a change variable;
3 variables which **affect** the link between cause-and-effect variables;
4 **connecting** or **linking** variables, which in certain situations are necessary to complete the relationship between cause-and-effect variables.

Figure 5.2 Types of variable in a causal relationship



In research terminology, change variables are called ***independent variables***, outcome/effect variables are called ***dependent variables***, the unmeasured variables affecting the cause-and-effect relationship are called ***extraneous variables*** and the variables that link a cause-and-effect relationship are called ***intervening variables***. Hence:

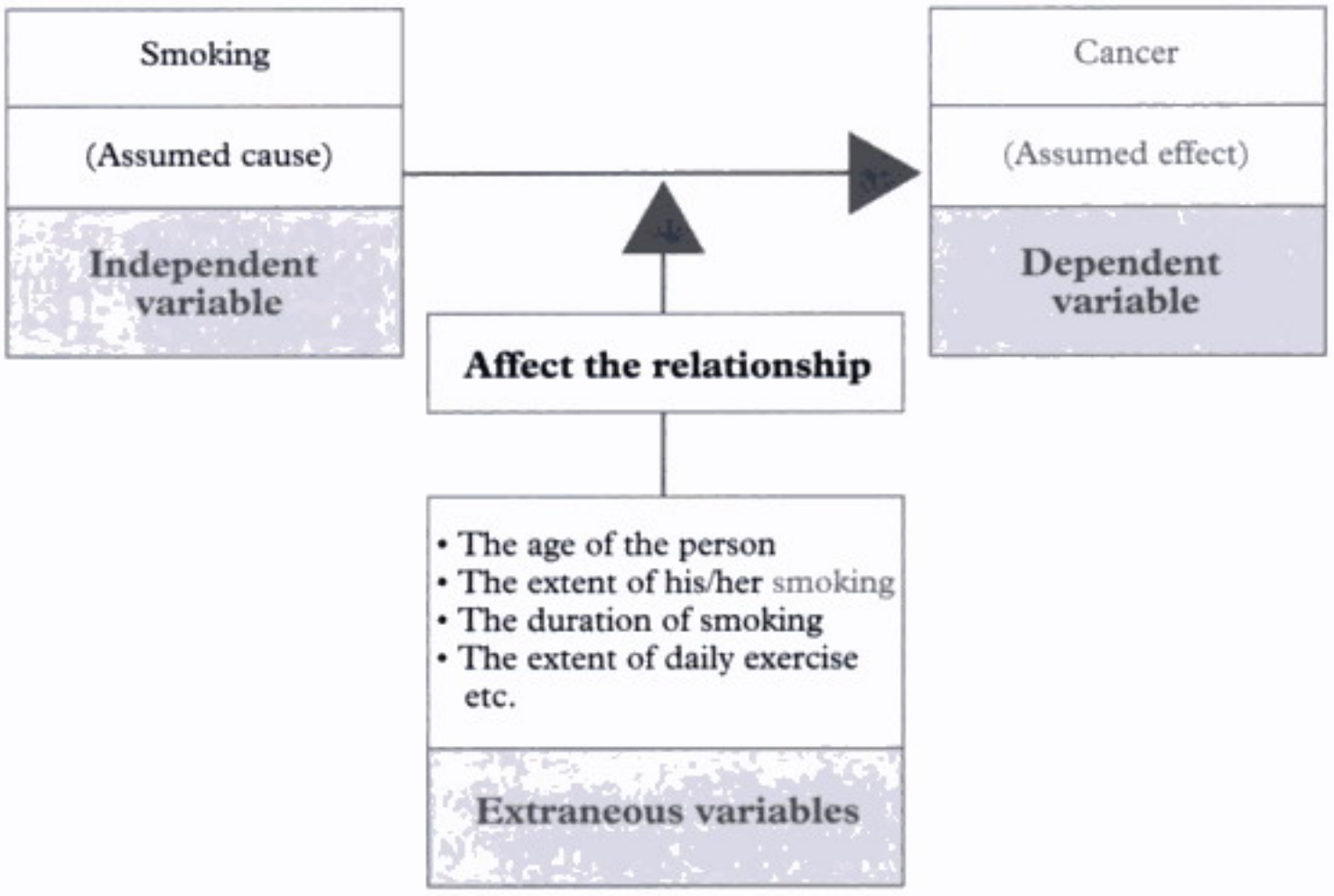
1 **Independent variable**—the cause supposed to be responsible for bringing about change(s) in a phenomenon or situation.
2 **Dependent variable** —the outcome of the change(s) brought about by introduction of an independent variable.
3 **Extraneous variable**—several other factors operating in a real-life situation may affect changes in the dependent variable. These factors, not measured in the study, may increase or decrease the magnitude or strength of the relationship between independent and dependent variables.

4 **Intervening variable**—sometimes called the confounding variable (Grinnell 1988: 203), links the independent and dependent variables. In certain situations the relationship between an independent and a dependent variable cannot be established without the intervention of another variable. The cause variable will have the assumed effect only in the presence of an intervening variable.

To explain these variables let us take some examples. Suppose you want to study the relationship between smoking and cancer. You assume that smoking is a cause of cancer. Studies have shown that there are many factors affecting this relationship, such as the number of cigarettes or the amount of tobacco smoked every day; the duration of smoking; the age of the smoker; dietary habits; and the amount of exercise undertaken by the individual. All of these factors may affect the extent to which smoking might cause cancer. These variables may either increase or decrease the magnitude of the relationship.

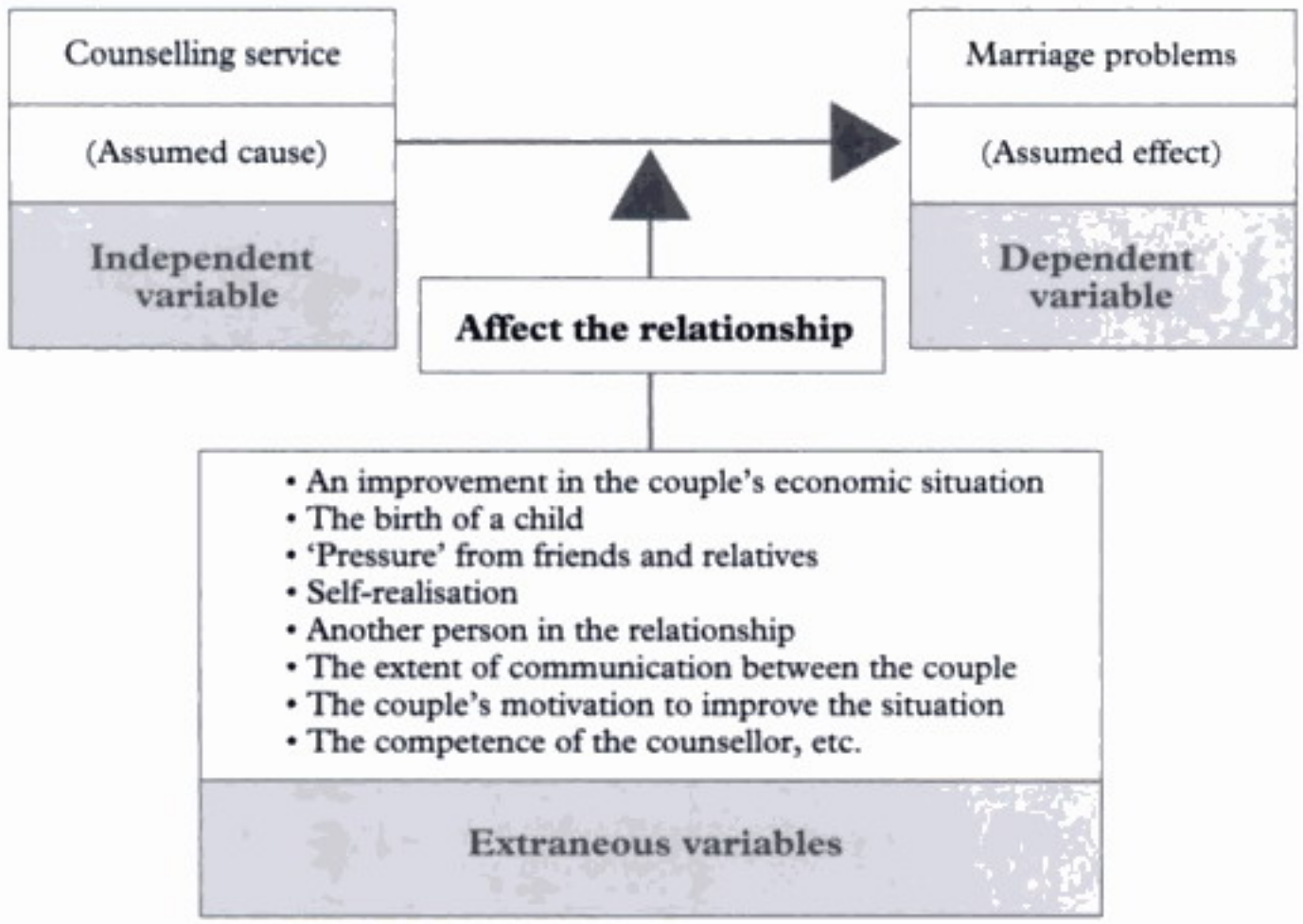
In the above example the extent of smoking is the independent variable, cancer is the dependent variable and all the variables that might affect this relationship, either positively or negatively, are extraneous variables. See Figure 5.3.

Figure 5.3 Independent, dependent and extraneous variables in a causal relationship



Let us take another example. Suppose you want to study the effects of a marriage counselling service on marital problems among clients of an agency providing such a service. Figure 5.4 shows the sets of variables that may operate in studying the relationship between counselling and marriage problems.

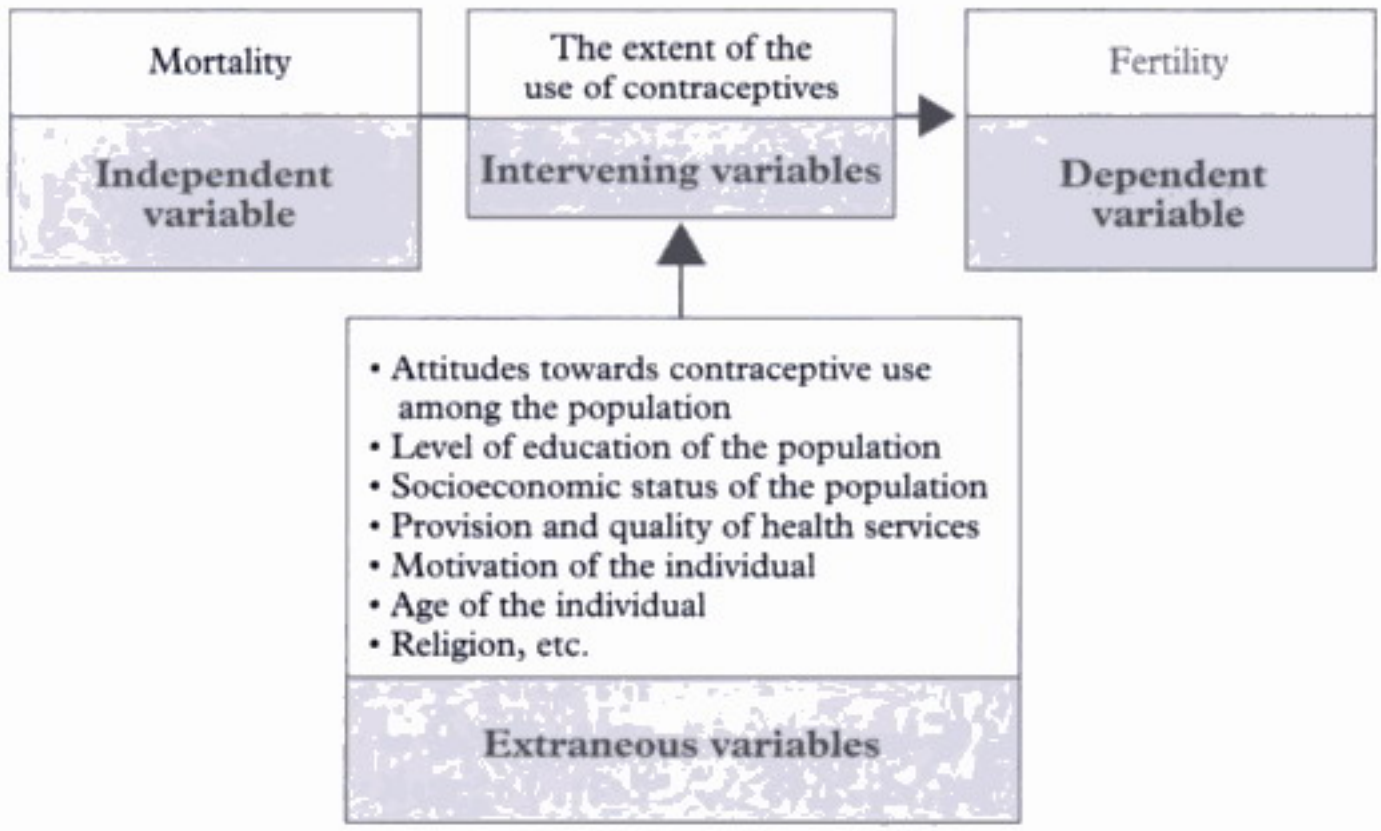
Figure 5.4 Sets of variables in counselling and marriage problems



In studying the relationship between a counselling service and marriage problems, it is assumed that the counselling service will influence the extent of marital problems. Hence, in the study of the above relationship, the type of counselling service is the independent variable and the extent of marriage problems is the dependent variable. The magnitude or strength of this relationship can be affected, positively or negatively, by a number of other factors that are not the focus of the study. These extraneous variables might be the birth of a child; improvement in a couple's economic situation; the couple's motivation to change the situation; the involvement of another person; self-realisation; and pressure from relatives and friends. Extraneous variables that work both ways can increase or decrease the strength of the relationship.

The example in Figure 5.5 should help you to understand intervening variables. Suppose you want to study the relationship between fertility and mortality. Your aim is to explore what happens to fertility when mortality declines. The history of demographic transition has shown that a reduction in the fertility level follows a decline in the mortality level, though the time taken to attain the same level of reduction in fertility varies markedly from country to country. As such, there is no direct relationship between fertility and mortality. With the reduction in mortality, fertility will decline only if people attempt to limit their family size. History has shown that for a multiplicity of reasons (the discussion of which is beyond the scope of this book) people have used one method or another to control their fertility, resulting in lower fertility levels. It is thus the intervention of contraceptive methods that completes the relationship: the greater the use of contraceptives, the greater the decline in the fertility level. The extent of the use of contraceptives is also affected by a number of other factors, for example attitudes towards contraception, level of education, socioeconomic

Figure 5.5 Independent, dependent, extraneous and intervening variables



status and age, religion, and provision and quality of health services. These are classified as extraneous variables.

In the above example, decline in mortality is assumed to be the cause of a reduction in fertility, hence, the mortality level is the independent variable and fertility is the dependent variable. But this relationship will be completed only if another variable intervenes—that is, the use of contraceptives. A reduction in mortality (especially child mortality) increases family size, and an increase in family size creates a number of social, economic and psychological pressures on families, which in turn create attitudes favourable to a smaller family size. This change in attitudes is eventually operationalised in behaviour through the adoption of contraceptives. If people do not adopt methods of contraception, a change in mortality levels will not be reflected in fertility levels. The population explosion in developing countries is primarily due to lack of acceptance of contraceptives. The extent of the use of contraceptives determines the level of the decline in fertility. The extent of contraceptive adoption by a population is dependent upon a number of factors. In this causal model, the fertility level is the dependent variable, the extent of contraceptive use is the intervening variable, the mortality level is the independent variable, and the unmeasured variables such as attitudes, education, age, religion, the quality of services, and so on are all extraneous variables. Without the intervening variable the relationship between the independent and dependent variables will not be complete.

From the viewpoint of the study design

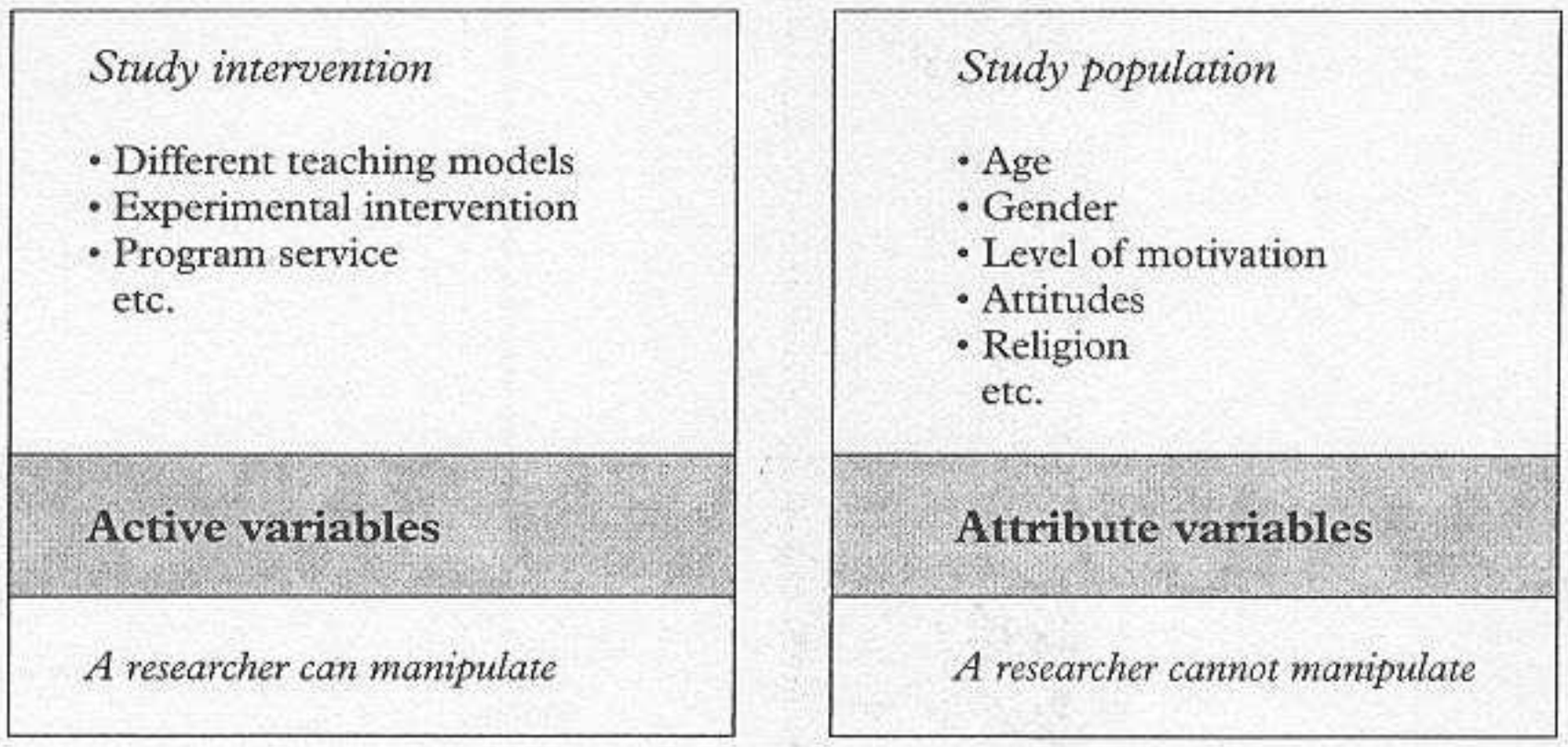
A study that examines association or causation may be a controlled/contrived experiment, a quasi-experiment or an *ex post facto* or non-experimental study. In controlled experiments the independent (cause) variable may be introduced or manipulated either by the researcher or by

someone else who is providing the service. In these situations there are two sets of variables (see Figure 5.6):

- **Active variables**—those variables that can be manipulated, changed or controlled.
- **Attribute variables**—those variables that cannot be manipulated, changed or controlled, and that reflect the characteristics of the study population; For example, age, gender, education and income.

Suppose a study is designed to measure the relative effectiveness of three teaching models (Model A, Model B and Model C). The structure and contents of these models could vary and any model might be tested on any population group. The contents, structure and testability of a model on a population group may also vary from researcher to researcher. On the other hand, a researcher does not have any control over characteristics of the student population such as their age, gender or motivation to study. These characteristics of the study population are called attribute variables. However, a researcher does have the ability to control and/or change the teaching models. S/he can decide what constitutes a teaching model and on which group of the student population it should be tested (if randomisation is not used).

Figure 5.6 Active and attribute variables



From the viewpoint of the unit of measurement

From the viewpoint of the unit of measurement, there are two ways of categorising variables:

- whether the unit of measurement is categorical (as in nominal and ordinal scales) or continuous in nature (as in interval and ratio scales);
- whether it is qualitative (as in nominal and ordinal scales) or quantitative in nature (as in interval and ratio scales).

The variables thus classified are called *categorical and continuous*, and *qualitative and quantitative*. On the whole there is very little difference between categorical and qualitative, and between continuous and quantitative, variables. The slight difference between them is explained below.

Categorical variables are measured on nominal or ordinal measurement scales, whereas for continuous variables the measurements are made either on an interval or a ratio scale. Categorical variables can be of three types:

1 constant;
2 dichotomous;
3 polytomous.

When a variable can have only one value or category, for example taxi, tree and water, it is known as a ***constant variable***. When a variable can have only two categories as in yes/no, good/bad and rich/poor, it is known as a ***dichotomous variable***. When a variable can be divided into more than two categories, for example: religion (Christian, Muslim, Hindu); political parties (Labor, Liberal, Democrat); and attitudes (strongly favourable, favourable, uncertain, unfavourable, strongly unfavourable), it is called a ***polytomous variable***.

Continuous variables, on the other hand, have continuity in their measurement; for example, age, income and attitude score. They can take on any value on the scale on which they are measured. Age can be measured in years, months and days. Similarly, income can be measured in dollars and cents.

In many ways qualitative variables are similar to categorical variables as both use either nominal or ordinal measurement scales. However, there are some differences. For example, it is possible to develop categories on the basis of measurements made on a continuous scale, such as measuring the income of a population in dollars and cents and then developing categories such as 'low', 'middle' and 'high' income. The measurement of income in dollars and cents is classified as the measurement on a continuous variable, whereas its subjective measurement in categories such as 'low', 'middle' and 'high' groups is a qualitative variable.

Although this distinction exists, for most practical purposes there is no real difference between categorical and qualitative variables or between continuous and quantitative variables. Table 5.3 shows similarities and differences among the various types of variable.

For a beginner it is important to understand that the way a variable is measured determines the type of analysis that can be performed, the statistical procedures that can be applied to the data, the way the data can be interpreted and the findings that can be communicated. You may not realise in the beginning that the style of your report is entirely dependent upon the way the different variables have been measured—that is, the way a question has been asked and its response recorded. The way you measure the variables in your study determines whether a study is 'qualitative' or 'quantitative' in nature. It is therefore important to know about the measurement scales for variables.

Table 5.3 Categorical/continuous and quantitative/qualitative variables

Categorical			*Continuous*	*Qualitative*	*Quantitative*
Constant	***Dichotomous***	***Polytomous***			
- water	- yes/no	Attitudes - strongly favourable - favourable - uncertain - strongly unfavourable Political parties - Labor - Liberal - Democrat Age* - old - young - child Income ^ - high - middle - low	Income ($) Age (years) Weight (kg)	Gender - female - male Educational level - high - average - low Age* - old - young - child Income - high - middle - low Temperature+ - hot - cold	Educational level — no. of years completed Age:* ____ years/months Income ^ ____ $ per year Temperature:+ ____ C or F
- tree	- good/bad				
- taxi	- rich/poor				
	- day/night				
	- male/ female				
	- hot/cold*				

* Can be classified in qualitative categories, e.g. old, young, child; or quantitatively on a continuous scale, e.g. in years, months and days.

^ Can be measured quantitatively in dollars and cents as well as qualitatively in categories such as high, middle and low.

\+ Similarly, temperature can be measured quantitatively in degrees on different scales (Celsius, Fahrenheit) or in qualitative categories such as hot and cold.

Types of measurement scale

> The frame into which we wish to make everything fit is one of our own construction; but we do not construct it at random, we construct it by measurement so to speak; and that is why we can fit the facts into it without altering their essential qualities (Poincaré 1952: xxv).

Measurement is central to any inquiry. The greater the refinement in the unit of measurement of a variable, the greater the confidence, other things being equal, one can place in the findings. One of the main differences between the physical and the social sciences is the units of measurement used and the degree of importance attached to them. In the physical sciences measurements have to be absolutely accurate and precise, whereas in the social sciences they may vary from the very subjective to the very quantifiable. Within the social sciences the emphasis on precision in measurement varies markedly from one discipline to another. An anthropologist normally uses very 'subjective' units of measurement, whereas an economist or an epidemiologist emphasises 'objective' measurement.

There are two main classification systems in the social sciences for measuring different types of variable. One was developed by S.S. Stevens (1946) and the other by Duncan (1984). According to Smith (1991: 72),

'Duncan (1984) has enumerated, in increasing order of interest to scientists, five types of measurement: nominal classification, ordinal scaling, cardinal scaling, ratio scaling, and probability scaling'. Duncan writes about Stevens's classification as follows:

> The theory of scale types proposed in 1946 by S S Stevens focused on nominal, ordinal, interval, and ratio scales of measurement. Some of his examples of these types—notably those concerning psychological test scores—are misleading (1984: viii).

However, Bailey considers that 'S S Stevens constructed a widely adopted classification of levels of measurement ...' (1978: 52). As this book is written for the beginner and as Stevens's classification is easier, it is used for discussion in this chapter. Stevens has classified the different types of measurement scale into four categories:

- nominal or classificatory scale;
- ordinal or ranking scale;
- interval scale;
- ratio.

Table 5.4 summarises the characteristics of the four scales.

The nominal or classificatory scale

A nominal scale enables the classification of individuals, objects or responses based on a common/shared property or characteristic. These people, objects or responses are divided into a number of subgroups in such a way that each member of the subgroup has a common characteristic. A variable measured on a nominal scale may have one, two or more subcategories depending upon the extent of variation. For example, 'water' and 'tree' have only one subgroup, whereas the variable 'gender' can be classified into two subcategories: male and female. Political parties in Australia can similarly be classified into four main subcategories: Labor, Liberal, Democrats and Greens. Those who identify themselves, either by membership or belief, as belonging to the Labor Party are classified as 'Labor', those identifying with the Liberals are classified as 'Liberal', and so on. The name chosen for a subcategory is notional, but for effective communication it is best to choose something that describes the characteristic of the subcategory.

Classification by means of a nominal scale ensures that individuals, objects or responses within the same subgroup have a common characteristic or property as the basis of classification. The sequence in which subgroups are listed makes no difference as there is no relationship among subgroups.

The ordinal or ranking scale

An ordinal scale has all the properties of a nominal scale plus one of its own. Besides categorising individuals, objects, responses or a property into subgroups on the basis of a common characteristic, it ranks the subgroups in a certain order. They are arranged either in ascending or descending

order according to the extent a subcategory reflects the magnitude of variation in the variable. For example, income can be measured either quantitatively (in dollars and cents) or qualitatively, using subcategories: 'above average', 'average' and 'below average'. (These categories can also be developed on the basis of quantitative measures, for example below $10 000 = below average, $10 000–$25 000 = average and above $25 000 = above average.) The subcategory 'above average' indicates that people so grouped have more income than people in the 'average' category, and people in the 'average' category have more income than those in the 'below average' category. These subcategories of income are related to one another in terms of the magnitude of people's income, but the magnitude itself is not quantifiable, and hence the difference between 'above average' and 'average' or between 'average' and 'below average' subcategories cannot be ascertained. The same is true for other variables such as socioeconomic status and attitudes measured on an ordinal scale.

Therefore, an ordinal scale has all the properties/characteristics of a nominal scale, in addition to its own. Subcategories are arranged in the order of the magnitude of the property/characteristic. Also, the 'distance' between the subcategories is not equal as there is no quantitative unit of measurement.

The interval scale

An interval scale has all the characteristics of an ordinal scale; that is, individuals or responses belonging to a subcategory have a common characteristic and the subcategories are arranged in an ascending or descending order. In addition, an interval scale uses a unit of measurement that enables the individuals or responses to be placed at equally spaced intervals in relation to the spread of the variable. This scale has a starting and a terminating point that is divided into equally spaced units/intervals. The starting and terminating points and the number of units/intervals between them are arbitrary and vary from scale to scale.

Celsius and Fahrenheit scales are examples of the interval scale. In the Celsius system the starting point (considered as freezing point) is zero and the terminating point (considered as boiling point) is 100°C. The gap between freezing and boiling points is divided into 100 equally spaced intervals, known as degrees. In the Fahrenheit system the freezing point is 32°F and the boiling point is 212°F, and the gap between the two points is divided into 180 equally spaced intervals. Each degree or interval is a measurement of temperature—the higher the degree, the higher the temperature. As the starting and terminating points are arbitrary, they are not absolute; that is, you cannot say that 60°C is twice as hot as 30°C or 30°F is three times hotter than 10°F. This means that while no mathematical operation can be performed on the readings, it can be performed on the differences between readings. For example, if the difference in temperature between two objects, A and B, is 15°C and the difference in temperature between two other objects, C and D, is 45°C, you can say that the difference in temperature between C and D is three

Table 5.4 **Characteristics and examples of the four measurement scales**

Measurement scale	*Examples*	*Characteristics of the scale*
Nominal or classificatory	A Tree, house, taxi, etc. B Gender: male/female Attitude: favourable unfavourable C Political parties - Labor - Liberal - Democrat - Green Psychiatric disorders - Schizophrenic - Paranoid - Manic-depressive etc. Religions - Christian - Islam - Hindu etc	Each subgroup has a characteristic/property which is common to all classified within that subgroup
Ordinal or ranking	Income - above average - average - below average Socioeconomic status - upper - middle - low Attitudes - strongly favourable - favourable - uncertain - unfavourable - strongly unfavourable Attitudinal scale (Likert scale—these are numerical categories) - 0–30 - 31–40 - 41–50 etc.	It has the characteristics of a Nominal scale, e.g. individuals groups, characteristic classified under a subgroup have a common characteristic PLUS Subgroups have a relationship to one another. They are arranged in ascending or descending order.
Interval	Temperature: - Celcius → 0°C - Fahrenheit → 32°F Attitudinal scale (Thurstone scale): - 10–20 - 21–30 - 31–40 - 41–50 etc.	It has all the characteristics of an ordinal scale (which also includes a nominal scale). PLUS It has a unit of measurement with an arbitrary starting and terminating point.
Ratio	Height: cm Income $ Age: years/months Weight: kg Attitudinal score: Guttman scale	It has all the properties of an interval scale. PLUS It has a fixed starting point, e.g. a zero point.

times greater than that between A and B. An attitude towards an issue measured on the Thurstone scale is similar. However, the Likert scale does not measure the absolute intensity of the attitude but simply measures it in relation to another person.

The interval scale is relative; that is, it plots the position of individuals or responses in relation to one another with respect to the magnitude of the measurement variable. Hence, an interval scale has all the properties of an ordinal scale, plus it has a unit of measurement with an arbitrary starting and terminating point. Therefore, it is relative in nature. It helps to place individuals or responses in relation to each other with respect to the magnitude of the measuring variable. As it is a relative scale no mathematical operations can be performed on its readings.

The ratio scale

A ratio scale has all the properties of nominal, ordinal and interval scales plus its own property: the zero point of a ratio scale is fixed, which means it has a fixed starting point. Therefore, it is an absolute scale—the difference between the intervals is always measured from a zero point. This means the ratio scale can be used for mathematical operations. The measurement of income, age, height and weight are examples of this scale. A person who is 40 years of age is twice as old as a 20-year-old. A person earning $60 000 per year earns three times the salary of a person earning $20 000.

SUMMARY

Knowledge of the different types of variable and the way they are measured plays a crucial role in research. Variables are important in bringing clarity and specificity to the conceptualisation of a research problem, to the formulation of hypotheses, and to the development of a research instrument. They affect how the data can be analysed, what statistical tests can be applied to the data, what interpretations can be made, how the data can be presented and what conclusions can be drawn. The way you ask a question determines its categorisation on a measurement scale, which in turn affects how the data can be analysed, what statistical tests can be applied to the data, what interpretations can be made, how the data can be presented and what conclusions can be drawn. Also, the way a variable is measured at the data-collection stage to a great extent determines whether a study is considered to be predominantly 'qualitative' or 'quantitative' in nature. It is important for a beginner to understand the different ways in which a variable can be measured and the implications of this for the study. A variable can be classified from three perspectives that are not mutually exclusive: causal relationship, design of the study and unit of measurement.

There are four measurement scales used in the social sciences: nominal, ordinal, interval and ratio. Any concept that can be measured on these scales is called a variable. Measurement scales enable highly subjective responses, as well as responses that can be measured with extreme precision, to be categorised. The choice of measuring a variable on a measurement scale is dependent upon the purpose of your study and the way you want to communicate the findings to readers.

The definition of a hypothesis

The functions of a hypothesis

The characteristics of a hypothesis

Types of hypothesis

Errors in testing a hypothesis

Summary

CHAPTER six

Constructing hypotheses

> Almost every great step [in the history of science] has been made by the 'anticipation of nature', that is, by the invention of hypotheses which, though verifiable, often had very little foundation to start with. (T.H. Huxley cited in Cohen & Nagel 1966: 197).

The definition of a hypothesis

The second important consideration in the formulation of a research problem is the construction of hypotheses. Hypotheses bring clarity, specificity and focus to a research problem, but are not essential for a study. You can conduct a valid investigation without constructing a single formal hypothesis. On the other hand, within the context of a research study, you can construct as many hypotheses as you consider to be appropriate. Some believe that one must formulate a hypothesis to undertake an investigation; however, the author does not hold this opinion. Hypotheses primarily arise from a set of 'hunches' that are tested through a study and one can conduct a perfectly valid study without having these hunches or speculations. However, in epidemiological studies, to narrow the field of investigation, it is important to formulate hypotheses.

The importance of hypotheses lies in their ability to bring direction, specificity and focus to a research study. They tell a researcher what specific information to collect, and thereby provide greater focus.

Let us imagine you are at the races and you place a bet. You bet on a hunch that a particular horse will win. You will only know if your hunch was right after the race. Take another example. Suppose you have a hunch that there are more smokers than non-smokers in your class. To test your hunch, you ask either all or just some of the class if they are smokers. You can then conclude whether your hunch was right or wrong.

Now let us take a slightly different example. Suppose you work in the area of public health. Your clinical impression is that a higher rate of a particular condition prevails among people coming from a specific population subgroup. You want to find out the probable cause of this condition. There could be many causes. To explore every conceivable possibility would require an enormous amount of time and resources. Hence, to narrow the choice, based on your knowledge of the field, you could identify what you assume to be the most probable cause. You could then design a study to collect the information needed to verify your hunch. If on verification you were able to conclude that the assumed cause was the real cause of the condition, your assumption would have been right.

In these examples, you started with a superficial hunch or assumption. In one case (horse racing) you waited for the event to take place and in the other two instances you designed a study to assess the validity of your assumption, and only after careful investigation did you reach a conclusion about the validity of your assumptions.

Hypotheses are based upon similar logic. As a researcher you *do not know* about a phenomenon, a situation, the prevalence of a condition in a population or about the outcome of a program, but you *do have a hunch* to form the basis

of certain *assumptions or guesses*. You test these by collecting information that will enable you to conclude if your hunch was right. The verification process can have one of the three outcomes. Your hunch may prove to be:

1 right;
2 partially right; or
3 wrong.

Without this process of verification, you cannot conclude anything about the validity of your assumption.

Hence, a hypothesis is a hunch, assumption, suspicion, assertion or an idea about a phenomenon, relationship or situation, the reality or truth of which you do not know. A researcher calls these assumptions, assertions, statements or hunches hypotheses and they become the basis of an inquiry. In most studies the hypothesis will be based upon either previous studies or on your own or someone else's observation.

There are many definitions of a hypothesis. According to Kerlinger, 'A hypothesis is a conjectural statement of the relationship between two or more variables' (1986: 17). *Webster's New International Dictionary of English Language* defines a hypothesis as:

> a proposition, condition, or principle which is assumed, perhaps without belief, in order to draw out its logical consequences and by this method to test its accord with facts which are known or may be determined.

Black and Champion define a hypothesis as, 'a tentative statement about something, the validity of which is usually unknown' (1976: 126). In another definition, Bailey defines a hypothesis as:

> a proposition that is stated in a testable form and that predicts a particular relationship between two (or more) variables. In other words, if we think that a relationship exists, we first state it as a hypothesis and then test the hypothesis in the field (1978: 35).

According to Grinnell and Stothers,

> A hypothesis is written in such a way that it can be proven or disproven by valid and reliable data—it is in order to obtain these data that we perform our study (Grinnell 1988: 200).

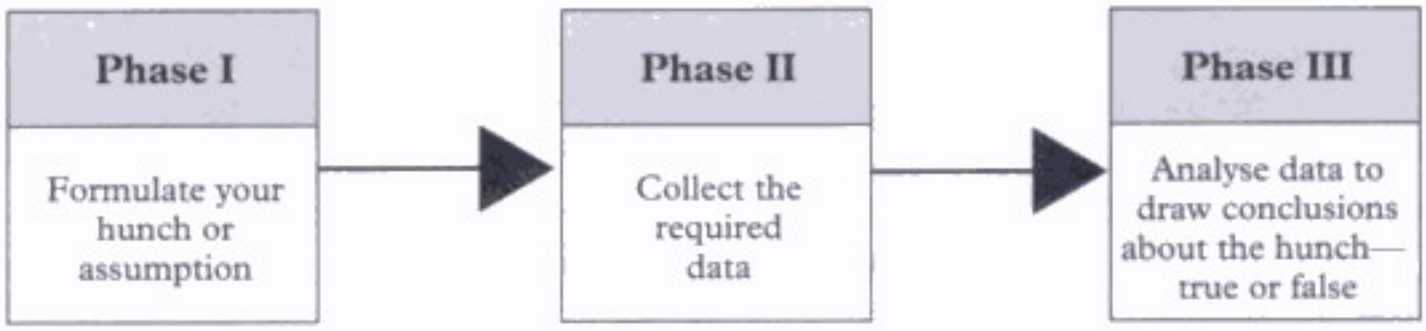
From the above definitions it is apparent that a hypothesis has certain characteristics:

1 It is a tentative proposition.
2 Its validity is unknown.
3 In most cases, it specifies a relationship between two or more variables.

The functions of a hypothesis

While some researchers believe that to conduct a study requires a hypothesis, having a hypothesis is not essential as already mentioned. However, a hypothesis is important in terms of bringing clarity to the research problem. See Figure 6.1.

Figure 6.1 The process of testing a hypothesis



Specifically, a hypothesis serves the following functions.

- The formulation of a hypothesis provides a study with focus. It tells you what specific aspects of a research problem to investigate.
- A hypothesis tells you what data to collect and what not to collect, thereby providing focus to the study.
- As it provides a focus, the construction of a hypothesis enhances objectivity in a study.
- A hypothesis may enable you to add to the formulation of theory. It enables you to specifically conclude what is true or what is false.

The characteristics of a hypothesis

There are a number of considerations to keep in mind when constructing a hypothesis, as they are important for valid verification.

- **A hypothesis should be simple, specific and conceptually clear.** There is no place for ambiguity in the construction of a hypothesis, as ambiguity will make the verification of your hypothesis almost impossible. It should be 'unidimensional'—that is, it should test only one relationship or hunch at a time. To be able to develop a good hypothesis you must be familiar with the subject area (the literature review is of immense help). The more insight you have into a problem, the easier it is to construct a hypothesis. For example:

> The average age of the male students in this class is higher than that of the female students.

The above hypothesis is clear, specific and easy to test. It tells you what you are attempting to compare (average age of this class), which population groups are being compared (female and male students), and what you want to establish (higher average age of the male students).

Let us take another example.

> 'Suicide rates vary inversely with social cohesion' (Black & Champion 1976: 126).

This hypothesis is clear and specific, but a lot more difficult to test. There are three aspects of this hypothesis: 'suicide rates'; 'vary inversely', which stipulates the direction of the relationship; and 'social cohesion'. To find out the suicide rates and to establish whether the relationship is inverse

or otherwise are comparatively easy, but to ascertain social cohesion is a lot more difficult. What determines social cohesion? How can it be measured? This problem makes it more difficult to test this hypothesis.

- **A hypothesis should be capable of verification.** Methods and techniques must be available for data collection and analysis. There is no point in formulating a hypothesis if it cannot be subjected to verification because there are no techniques to verify it. However, this does not necessarily mean that you should not formulate a hypothesis for which there are no methods of verification. You might, in the process of doing your research, develop new techniques to verify it.
- **A hypothesis should be related to the existing body of knowledge.** It is important that your hypothesis emerges from the existing body of knowledge, and that it adds to it, as this is an important function of research. This can only be achieved if the hypothesis has its roots in the existing body of knowledge.
- **A hypothesis should be operationalisable.** This means that it can be expressed in terms that can be measured. If it cannot be measured, it cannot be tested and, hence, no conclusions can be drawn.

Types of hypothesis

As explained, any assumption that you seek to validate through an inquiry is called a hypothesis. Hence, theoretically there should be only one type of hypothesis, that is, the research hypothesis—the basis of your investigation. However, because of the conventions in scientific inquiries and because of the wording used in the construction of a hypothesis, hypotheses can be classified into several types. Broadly, there are two categories of hypothesis:

1 research hypotheses;
2 alternate hypotheses.

The formulation of an ***alternate hypothesis*** is a convention in scientific circles. Its main function is to explicitly specify the relationship that will be considered as true in case the research hypothesis proves to be wrong. In a way, an alternate hypothesis is the opposite of the research hypothesis. Again, conventionally, a null hypothesis, or hypothesis of no difference, is formulated as an alternate hypothesis.

Let us take an example. Suppose you want to test the effect different combinations of maternal and child health services (MCH) and nutrition supplements (NS) have on the infant mortality rate. To test this a two-by-two factorial experimental design is adopted (see Figure 6.2).

There are several ways of formulating a hypothesis. For example:

1 There will be no difference in the level of infant mortality among the different treatment modalities.
2 The MCH and NS treatment group will register a greater decline in infant mortality than the MCH, the NS treatment or the control group.
3 Infant mortality in the MCH treatment group will reach a level of 30/1000 over five years.

Figure 6.2 Two-by-two factorial experiment to study the relationship between MCH, NS and infant mortality

		Maternal and child health services (MCH)	
		Yes	**No**
Nutrition supplements (NS)	**Yes**	MCH + NS	NS
	No	MCH	Control

4 Decline in the infant mortality rate will be three times greater in the MCH treatment group than in the NS one over five years.

Let us take another example. Suppose you want to study the smoking pattern in a community in relation to gender differentials. The following hypotheses could be constructed.

1 There is no significant difference in the proportion of male and female smokers in the study population.
2 A greater proportion of females than males are smokers in the study population.
3 A total of 60 per cent of females and 30 per cent of males in the study population are smokers.
4 There are twice as many female smokers as male smokers in the study population.

In both sets of examples, the way the first hypothesis has been formulated indicates that there is no difference either in the extent of the impact of different treatment modalities on the infant mortality rate or in the proportion of male and female smokers. When you construct a hypothesis stipulating that there is no difference between two situations, groups, outcomes, or the prevalence of a condition or phenomenon, this is called a ***null hypothesis*** and is usually written as Ho.

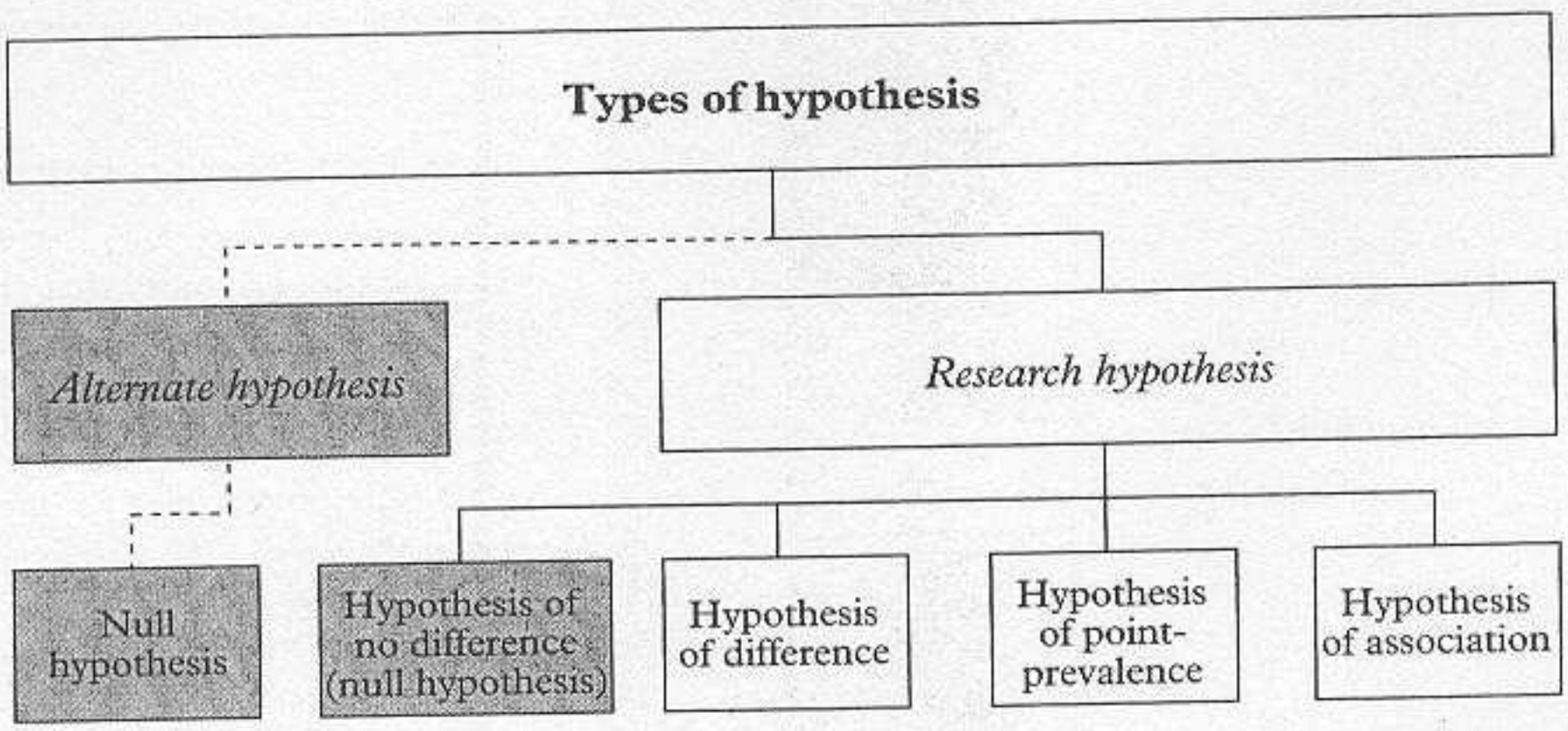
The second hypothesis in each example implies that there is a difference either in the extent of the impact of different treatment modalities on infant mortality or in the proportion of male and female smokers among the population, though the extent of the difference is not specified. A hypothesis in which a researcher stipulates that there will be a difference but does not specify its magnitude is called a ***hypothesis of difference***.

A researcher may have enough knowledge about the smoking behaviour of the community or the treatment program and its likely outcomes to speculate almost the exact prevalence of the situation or the outcome of a treatment program in quantitative units. Examine the third hypothesis in both sets of examples: the level of infant mortality is 30/1000 and the proportion of female and male smokers is 60 and 30 per cent respectively. This type of hypothesis is known as a ***hypothesis of point-prevalence***.

The fourth hypothesis in both sets of examples speculates a relationship between the impact of different combinations of MCH and NS programs on the dependent variable (infant mortality) or the relationship between the prevalence of a phenomenon (smoking) among different populations (male and female). This type of hypothesis stipulates the extent of the relationship in terms of the effect of different treatment groups on the dependent variable ('three times greater in the MCH treatment group than in the NS one over five years') or the prevalence of a phenomenon in different population groups ('twice as many female as male smokers'). This type of hypothesis is called a ***hypothesis of association***.

There may be some confusion about null and research hypotheses, as in Figure 6.3 the null hypothesis is also classified as hypothesis of no difference under 'research hypothesis'. Any type of hypothesis, including a null hypothesis, can become the basis of an inquiry. When a null hypothesis becomes the basis of an investigation, it becomes a research hypothesis.

Figure 6.3 Types of hypothesis



Errors in testing a hypothesis

As already mentioned, a hypothesis is an assumption thay may prove to be either correct or incorrect. It is possible to arrive at an incorrect conclusion about a hypothesis for a variety of reasons. Incorrect conclusions about the validity of a hypothesis may be drawn if:

- the study design selected is faulty;
- the sampling procedure adopted is faulty;
- the method of data collection is inaccurate;
- the analysis is wrong;
- the statistical procedures applied are inappropriate; or
- the conclusions drawn are incorrect.

Any, some or all of these aspects of the research process could be responsible for the inadvertent introduction of error in your study, making conclusions misleading. Hence, in the testing of a hypothesis there is always

the possibility of errors attributable to the reasons identified above. Figure 6.4 shows the types of error that can result in the testing of a hypothesis.

Figure 6.4 Type I and Type II errors in testing a hypothesis

When your decision is to:	*When a null hypothesis is actually:* True	False
Accept	Correct decision	Type I error
Reject	Type II error	Correct decision

Hence in drawing conclusions about a hypothesis, two types of error can occur:

- *rejection* of a null hypothesis when it is true. This is known as a ***Type I error***.
- *acceptance* of a null hypothesis when it is false. This is known as a ***Type II error***.

SUMMARY

Hypotheses, though important, are not essential for a study. A perfectly valid study can be conducted without constructing a single hypothesis. Hypotheses are important for bringing clarity, specificity and focus to a research study.

A hypothesis is a speculative statement that is subjected to verification through a research study. In formulating a hypothesis it is important to ensure that it is simple, specific and conceptually clear; is able to be verified; is rooted in an existing body of knowledge; and able to be operationalised.

There are two broad types of hypothesis: a research hypothesis and an alternate hypothesis. A research hypothesis can be further classified, based upon the way it is formulated, as a null hypothesis, a hypothesis of difference, a hypothesis of point-prevalence and a hypothesis of association.

The testing of a hypothesis becomes meaningless if any one of the aspects of your study—design, sampling procedure, method of data collection, analysis of data, statistical procedures applied or conclusions drawn—is faulty or inappropriate. This can result in erroneous verification of a hypothesis: Type I where you reject a null hypothesis when it is true and should not have been rejected; and Type II where you accept a null hypothesis when it is false and should not have been accepted.